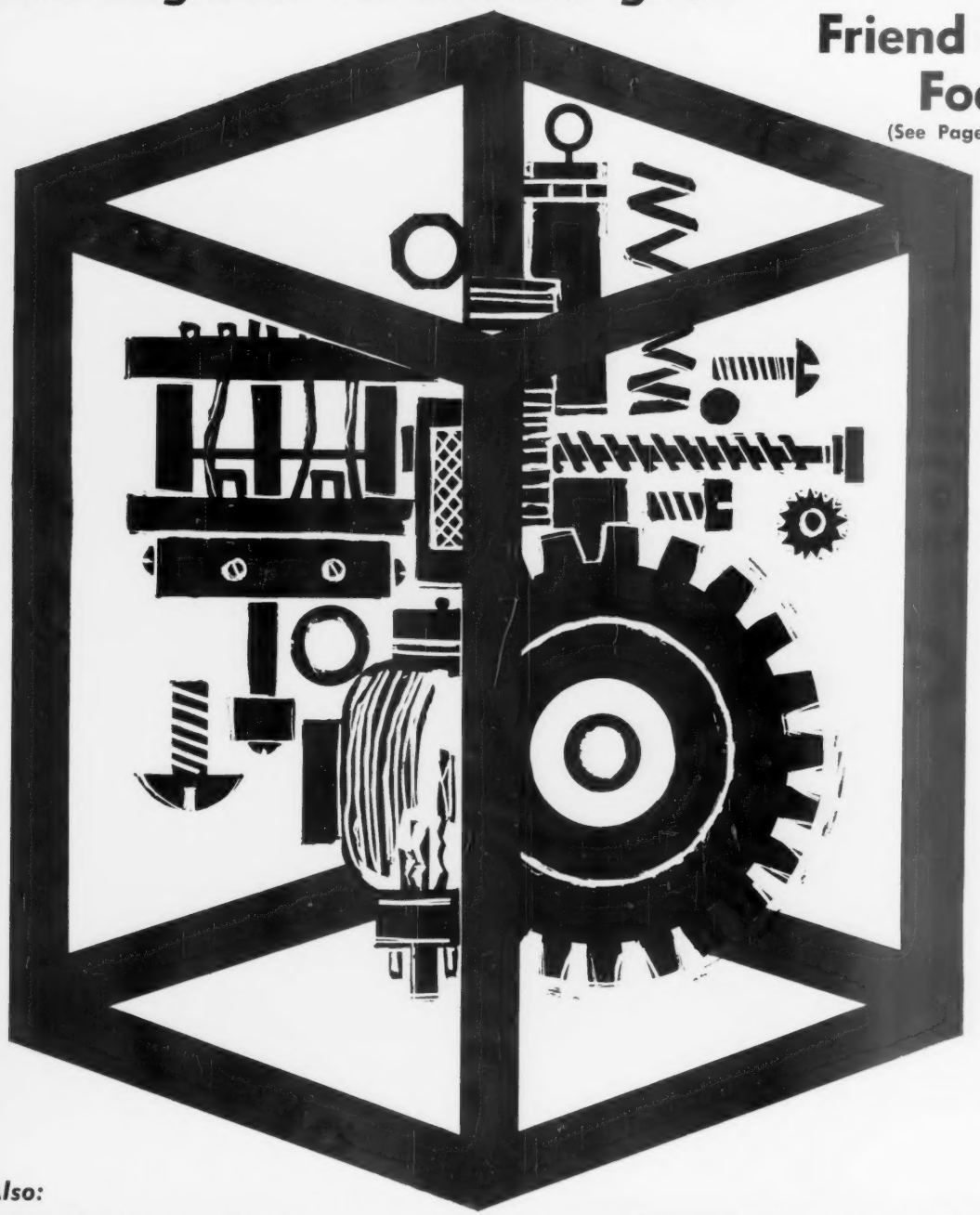
American Engineer

The Engineer vs The Designer—

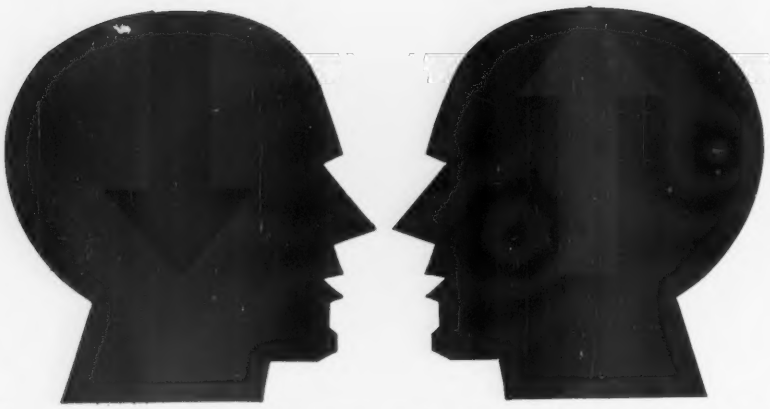
Friend or Foe?

(See Page 21)



Also:

- *At the Crossroads of Engineering Education*
- *Leonardo da Vinci: Civil Engineer*
- *More Humanities or More Engineering?*



There are significant differences in the professional attitudes and objectives of engineers in industry, and the latest PECBI survey report* shows what these are and why.

*ENGINEERING PROFESSIONALISM IN INDUSTRY:

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American Engineer

JANUARY 1961
Vol. 31, No. 1

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS FOUNDED 1934

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Letters to the Editor

Improved Education . . .

Dear Editor:

I can't resist a bit of rebuttal to Dr. Harrington's letter (AE, November, 1960, page 10) in which he takes me to task for having the temerity to criticize public education. First, however, I should like to congratulate him on earning his string of advanced degrees. It must be a delightful experience to be able to find time to continue formal education for many years. Most of us are not so fortunate.

As Dr. Harrington surmised, I received my engineering degree quite a few years ago. If it will make the good doctor happy, I am willing to concede that I probably could not earn that degree today. However, I fail to see the connection between my intellectual capacity and the quality of public education.

I am not alone in my opinion of the value of current educational programs. Within the past three months, two events have occurred which strongly reinforce my position.

Addressing a convention of the New Jersey Public School Superintendents, a prominent industrialist stated bluntly that he would rather employ a parochial high school graduate than one from a public high school because the former received much better training in English than the latter. I suppose Dr. Harrington would deny this man the right to criticize the public schools, also, but he has obviously learned the quality of the two types of schools by personal observation. One needs no advanced degree to judge the performance of an individual on day-to-day jobs.

Announcement was made within the past few weeks, that the College Entrance Examining Board's Commission to develop methods of improving the teaching of English in the public schools is about to start its program of "re-educating" teachers. The program will stress grammar, writing and an understanding of the language. The fact that the setting up of this commission was deemed necessary is sufficient proof, in my opinion, of the need for improvement in the teaching of English.

On these two examples, I rest my case.

JOHN L. EVERHART, P.E.
Westfield, N.J.

'Most Registered . . .'

Dear Editor:

The November, 1960, issue of the AMERICAN ENGINEER, page 39, confers upon Mr. Charles C. Bonin, engineering manager of Ebasco Services Incorporated of New York City, the title, "Most Registered Engineer in the United States." The title is certainly deserved though I hasten to write to call your attention to the fact that there are others in the country, like Vice President Nixon, running a very close second.

Besides holding my national certificate with NCSBEE, I, too, am registered in 47 of the 50 states and hold licenses in the District of Columbia and the Panama Canal Zone for a total of 49 compared to Mr. Bonin's 51.

Obviously, I hold these licenses for the same reason that Mr. Bonin has acquired his in that I am the owner and sole proprietor of my own firm employing almost 1,000 engineers and supporting personnel in the performance of our work throughout the United States and many foreign countries.

I, too, have had the distinction of receiving various airline accreditations indicating that my travels have exceeded 5 million miles around the world in the performance and direction of our company's work. It gets rather tiresome after a while.

As a member and present chairman of the Pennsylvania Registration Board for Professional Engineers and Surveyors, I am pleased to note that there are others who actively support and promote registration throughout the nation by reason of their acquisition and continued renewal and use of professional licenses in the many states of the nation. We need more men like Mr. Bonin.

MICHAEL BAKER, JR., P.E.
Rochester, Pa.

Status . . .

Dear Editor:

In the June, 1960, edition of the AMERICAN ENGINEER there appeared a very interesting idea described by G. E. Crandell Burns, P.E., Concord, Mass., in his "Letter to the Editor."

Many difficulties of various types might disappear if professional engineers performed according to a contractual arrangement instead of in an "employee" status.

To know the details and progress of Mr. Burns' proposal might well be a matter of general interest.

GUY M. PAGE, P.E.
Camp Hill, Pa.

U. S. Engineers . . .

Dear Editor:

I have just received a copy of the AMERICAN ENGINEER for December, 1960, containing the spread on my remarks at the recent (NSPE) meeting in Denver. You were most kind in your handling of my remarks and I want you to know that I appreciate it.

We are proud of our engineering staff and the work that they are able to accomplish, and your magazine has provided the best opportunity we have had to tell their story.

There is a place in our operations for both the Federal-employed engineer and the engineer in private practice, and we hope to cooperate in such a manner that all of their services may be utilized in the public interest.

FLOYD E. DOMINY,
Commissioner, U. S.
Bureau of Reclamation,
Wash., D. C.

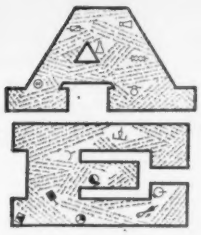
Government Staffs . . .

Dear Editor:

The views expressed by Mr. Floyd E. Dominy, commissioner, U. S. Bureau of Reclamation, in his fine article, "Why Government Agencies Need Their Own Engineering Staffs," appearing in the AMERICAN ENGINEER for December, 1960, have my hearty endorsement. Congratulations to you and the Society of Professional Engineers for publishing this article.

As an engineer with more than 36 years of professional experience in government service, I am firmly committed to the belief that engineering should be done by engineers. In those agencies of government charged with engineering responsibilities it is, therefore, important not only that there be qualified engineers in policy making positions but that they have available

(Continued on page 6)



"This Month"

Is there a lingering "cold war" between the engineer and the designer? Can they work together to the mutual benefit of themselves and a client? "The Engineer vs the Designer–Friend or Foe?–"page 21–is the story about a designer and an engineer who formed a partnership and made it work!

Engineering becomes more complex and yet more "professional" types are needed for today's big jobs. So, do colleges increase technical training or add more of the humanities? One point of view begins "This Month" on page 27.

"The Engineer and the Law"–page 29–covers architectural and engineering laws, and our other short piece, "An AE Special Report"–page 38–reviews a recent institute held by Penn State for the more effective teaching of engineering subjects.

The intrepid Leonardo da Vinci is presented in still another light (this time as a civil engineer) beginning on page 30. Interesting woodcuts, too.

A "voice for specialization" in engineering education speaks out starting on page 35. Do you agree with these views?

In the news:

General. Page 7. The lead stories: The National Science Foundation reports that employment of engineers and scientists in industry continues to rise with the greatest proportionate increase being for physical scientists . . . The President's National Conference on Water Pollution, just concluded, voiced opinions on subjects ranging from "meeting the growing competition for water" to "keeping water clean."

Consulting. Page 9. The headlines: Labor Dept. Will Proceed Slowly on Davis-Bacon Act . . . Final Regional Meeting Held in Boise, Idaho . . . Corporate Tax Status Determined by IRS . . . California Court Supports Engineer . . . Sacks to Draft Building Code for Philadelphia.

Industry. Page 12. Stories include report on "unfair practice" charge against Sperry Gyroscope Co. . . . Survey of engineering grads taken by Purdue which shows, among many other things, that only 25 per cent are registered . . . an AMA study throws some light on "moonlighting" . . . and a university dean defines "engineer" and "scientist."

Government. Page 14. In the headlines: Struggle to Register City Engineers Waged in Chicago . . . Health Service Starts Pollution Division . . . BLS Survey on Federal Pay Scale Released.

Education. Page 17. A new report shows that engineering teachers make about 14 per cent more money now than they did two years ago. Other news deals with NSF grants for science and math teachers, and in a final story an official of the Dept. of Public Works, Miami, Florida, plugs for careers in public works for young engineers.

Kenneth E. Trombley

Editor

LETTERS

(*Continued from page 4*)

the finest staff of professional men to assist in formulating decisions, to effect designs, to carry on research, and to prosecute construction.

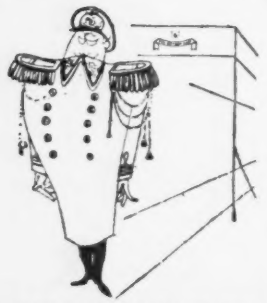
These men form, in each instance, a team to insure that the people of the United States will obtain the best possible results for the dollars expended. They also provide a reservoir from which leaders can be drawn in the future.

Certainly engineers in private firms and those in government must often combine their efforts, particularly in large and complex programs in which the maximum skills, experience, and ability, from whatever source, are essential to insure the best possible results.

Government engineers should be continually urged and encouraged to attain professional status by state registration.

If the engineering profession is to achieve the prestige it deserves, there must be more support of its members in all ranks by the technical societies, including efforts to place professional men in executive and policy positions.

HERBERT D. VOGEL, P.E.
Knoxville, Tenn.



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(Circle 1 in Readers' Service Dept.)

Registration for all? . . .

Dear Editor:

I believe that the action of the NSPE in asking for reconsideration of a Davis-Bacon Act ruling which classed rodmen, chainmen and instrumentmen as "laborers and mechanics" was unwise for the following reasons:

- The proper function of the NSPE is to represent engineers, not miscellaneous non-registered persons.
- This action by the NSPE downgrades the engineering profession by endorsing the principle that the work of survey party personnel is "based on professional training."
- It deprives survey party personnel of the right to receive the prevailing wage on federal projects.
- It supports the contention that a person's training should be the basis of job classification rather than the work performed. (If an archbishop is out in the brush dragging a chain, he is rightly considered a chainman in the eyes of the Labor Department and would certainly not receive the "prevailing wage" of an archbishop.)

I suggest that the NSPE give attention to matters such as the outrageous Sec. 22e of the NCSBEE "Model" law which is a blanket exemption from registration for engineers employed by the Federal government. This policy has resulted in non-registered persons with only a fourth grade education being classed as grade 14 engineers, ($13,000 per annum) by the Civil Service Commission. There is no more reason to exempt Federal employees from state registration than from state or local traffic regulations. It is of note that physicians and lawyers employed by the Federal government are not exempted from registration or its equivalent.

It has been suggested that Sec. 22e of the Model Law be revised by inserting language in this exemption paragraph which would require Federal engineers to be registered in their state of residence or principal employment.

I urge the NSPE to cease its efforts to represent non-registered persons and concern itself with the multitudinous problems of engineers employed by the Federal government. A good beginning would be the revision of Sec. 22e of the NCSBEE Model Law to grant Federal engineers the same status as physicians and lawyers in the Federal employ.

WALLACE D. BARLOW, P.E.
Washington 16, D.C.

► ***Editor's Note:*** **It should be pointed out that it is well established that a state law may not impose a registration requirement on Federal employees.**

Definitions . . .

Dear Editor:

The following definitions were evolved from earlier definitions after a marked need was shown for them:

- A *consulting engineer* is a professional engineer who holds himself out to the public for hire as able to practice engineering—a professional engineer in private practice.
- *Engineering* is the science of the analysis, design, construction and operation of machines, processes, structure, utilities and public works, requiring the employment of mathematics and the physical sciences in its application.
- A *professional engineer* is a person who has met the minimum standards established by the engineering registration statutes of the states wherein he is practicing. In many states these standards include graduation from an engineering college accredited by ECPD, adequate experience and demonstrated technical capacity.

LEONARD M. TODD, P.E.
New York, N.Y.

Unions . . .

Dear Editor:

In the December issue of AMERICAN ENGINEER, page 28, I notice an item under "Mandatory Society Membership Questioned" . . .

. . . Now, in the article there is the thought that it should be mandatory for one to be a member of a society (state or national) before he can practice as a professional engineer. . . .

Certainly if it is mandatory to be a member of any society before a professional engineer can obtain a license, we are bordering on unionizing the professional engineer.

GILBERT C. LAMB, SR., P.E.
Butler, Wis.

NSF Shows More Engineers And Scientists Employed

Employment of scientists and engineers in industry rose nearly seven per cent between January, 1959, and January, 1960, the National Science Foundation has reported. This compares to only a five per cent rise from 1958 to 1959.

The proportionate increase from 1959 to 1960 was greatest for physical scientists, but the growth in number of engineers greatly exceeded that of other occupational groups.

More than 800,000 scientists and engineers were employed in January, 1960, by the U. S. business firms covered by a survey. This compares to the 764,000 employed by a similar group of firms in January, 1959. Additional scientists and engineers were self-employed or in small firms not covered by the survey.

The figures are based on preliminary estimates from a survey conducted for NSF by the Bureau of Labor Statistics of the U. S. Department of Labor. More than 10,000 companies cooperated to furnish the data, which will aid in developing programs designed to strengthen the country's scientific manpower resources.

About 80 per cent of the scientists and engineers covered by the survey were engineers. Of the remaining 20 per cent, nearly half were chemists. Other physical scientists, including physicists, mathematicians, metallurgists, and geologists, made up an additional 35 per cent of scientific employment.

Industrial firms had a net increase of approximately 40,000 engineers between January, 1959, and 1960. This rise in engineering employment represented a 6.6 per cent increase—a much greater growth than occurred during 1958. Employment of scientists rose by more than 10,000 from 1959 to 1960—a 7 per cent increase.

NSF will publish a final report on the survey early in 1961, presenting detailed employment statistics. Preliminary figures in this release may be revised after detailed analysis.

Swedish Professor Makes U.S. Tour for EJC, ASCE

Dr. Evert Arne Bjerhammar of the Swedish Royal Institute of Technology has begun a 2-month lecture tour of United States engineering colleges. The tour is sponsored by Engineers Joint Council and the American Society of Civil Engineers under a grant from the National Science Foundation, and is coordinated by the Surveying and Mapping Division of the ASCE.

Dr. Bjerhammar, professor of geodesy at the Royal Institute in Stockholm, is well-known in international surveying circles. He has specialized in optical and electronic distance measuring devices, paralyx triangulation automatic mapping, and applications of the calculus of matrices to the method of least squares.

The tour includes some 25 colleges and universities throughout the country. Dr. Bjerhammar will address photogrammetry and geodesy graduate and undergraduate students, and other civil engineering students. He will also hold conferences and seminars, and address various student and local chapters of ASCE.

UET Announces Recent Election of New Officers

United Engineering Trustees, Inc., an organization of five major national engineering societies, has announced at its New York headquarters the election of Willis F. Thompson, New Haven, Conn., as president.

Thompson, who is executive vice president of Westcott and Mapes, Inc., of New Haven and a former vice president of The American Society of Mechanical Engineers, succeeds Andrew Fletcher, New York, chairman of the Board of Directors of St. Joseph Lead Company, and former president of the American Institute of Mining, Metallurgical and Petroleum Engineers.

UET announced, also, the elec-

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(Circle 2 in Readers' Service Dept.)

tion of two new vice presidents—James F. Fairman, New York, senior vice president of Consolidated Edison Company, representing the American Institute of Electrical Engineers, and L. C. Kemp, Jr., of New York, vice president of Texaco, Inc., representing the American Institute of Chemical Engineers.

Ratings for Concrete Set in San Francisco

The Board of Examiners of the City and County of San Francisco has established definite fire resistance ratings for prestressed concrete construction based on recommended concrete covers for the prestressing steel, Norman Scott, executive secretary, Prestressed Concrete Institute, Chicago, announced recently.

The Board recently voted unanimously to recognize prestressed concrete construction on the basis of specifications outlined in the Uniform Building Code, one of the four major building codes used in the United States and the one primarily used in the eleven Western States.

These established fire resistance ratings follow closely those stated in section 215.3 of the American Concrete Institute and the American Society of Civil Engineers' Joint Committee 323 Recommendations for Prestressed Concrete.

Newark College Offers Course on Waste, Sewage

A new seminar entitled "Theory and Operation of Sewage and Waste Water Treatment Processes," scheduled to start January 5, has been announced by the Special Courses Division, Newark College of Engineering.

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(Circle 3 in Readers' Service Dept.)

The 2-part seminar, which will run until June, is being presented by NCE in cooperation with the New Jersey State Department of Health and the New Jersey Water Pollution Control Association.

Applicants for the program, according to Division Director Clarence H. Stephans, should have an established interest in the topic. They must have a high school diploma or the equivalent in training or experience.

Objectives of the seminar are to provide an educational program to upgrade those concerned with the operation or supervision of sewage and waste treatment plants. The program also will provide a background in basic principles for those planning to take state licensing examinations.

Water Conference Makes Several Recommendations

More than 1,000 delegates to the National Conference on Water Pollution in Washington, D.C., recently discussed 31 recommendations for action on pollution control.

The recommendations were placed before the plenary session of the conference by the chairmen of four panels and were based on work done in earlier group meetings.

The first panel, which discussed "Water Pollution and Our Changing Times," submitted twelve recommendations which concerned mainly the definition of the problem and the need to set up measures and organizations to handle it. One such recommendation was that "appropriate public and private agencies mount and sustain an expanded program of public information to the end that enlightened public opinion can be brought to bear on the accomplishments, constructions, needs, opportunities, and problems involved in water quality management, noting that this conference should provide a dramatic opportunity to launch such a program."

The first panel also recommended industries should be encouraged to install needed waste treatment facilities, and that states should develop water monitoring programs to maintain the necessary bacteriological and chemical quality of water.

The second panel, discussing the problem, "Meeting the Growing Competition for Water," recommended, "planning for the comprehensive development of each major basin or water resource area should be established as a fixed national policy."

They also suggested that the authority to develop a water quality criteria might come under the Public Health Service, recognizing in their suggestion for such a criteria that different geographic areas, because of the variations in chemical composition, might need different criteria. That the need to allow room in national, state and local budgets for water pollution control is necessary was also emphasized.

The third panel submitted five recommendations on "Keeping Water Clean." They stressed the need to determine the level of quality which should be maintained in any water supply. Panel three recognized more than any other group the role which the Federal government must play in pollution control, stressing the value of Federal grants-in-aid, and public information programs which originate at the Federal level.

"Research and Training" was covered by the fourth panel. Their first recommendation was that "the flow of engineers and scientists who are competent to advance and administer the scientific, technological, and economic conservation of our water resources . . . must be increased promptly. . . ."

The final panel put much responsibility on colleges and universities for adequate training. They recommended Federal grants-in-aid as one method of increasing the staff and facilities for training individuals to deal with problems of water control, as well as expanding research at all levels.

Chairmen of the four sections were Thomas A. McCann, mayor of Fort Worth, Texas; E. A. Ackerman, executive officer, Carnegie Institution of Washington; Dr. Abel Wolman, professor of sanitary engineering, the Johns Hopkins University and Dr. Gordon M. Fair, professor of sanitary engineering, Harvard University.

Labor Dept. Will Proceed Slowly on Davis-Bacon Act

Department of Labor officials have indicated that they will proceed slowly and cautiously in applying the recent ruling that survey crew personnel are subject to the Davis-Bacon Act. Since its adoption in 1932, the law had been construed not to apply to such employees as rodmen, chainmen and instrumentmen. It authorizes the Secretary of Labor to prescribe prevailing pay rates for various classifications of laborers and mechanics on Federal and Federally aided construction.

Following the issuance of the ruling reversing the Department's previous stand, the NSPE Board of Directors voted to ask for a reconsideration. The Secretary of Labor was accordingly advised by NSPE that it protested the issuance of the ruling without any advance notice, hearing or opportunity to submit its views on the question of surveying crew coverage. The request for reconsideration was supported by NSPE's view that survey crew personnel "are more accurately identified and regarded by the engineering profession as sub-professional employees," rather than in the category of laborers and mechanics. It was pointed out that recent engineering graduates are often employed in survey crew positions in the early years of their practice and that categorizing them as "laborers and mechanics" may have "a most detrimental influence upon their career choice. . . ."

The Secretary of Labor was also advised that rodmen, chainmen, and instrumentmen "are required to have technical knowledge and a basic understanding of the engineering and surveying aspects of the work." Additionally, it was noted that the Ohio attorney general on two separate occasions considered the same question under a comparable state law and concluded in both instances that the legislation was intended to cover "only men who work with their hands, and who are included in the commonly accepted definitions of 'mechanic,' 'workman,' and 'laborer,' and did not . . . include persons whose work is based on professional training." NSPE added, "We believe the same was true of the Congress in adopting the Davis-Bacon Act."

At a subsequent meeting with Department of Labor officials, L. M. Van Doren, a consulting engineer of Topeka, Kansas, and chairman of the NSPE Functional Section for Consulting Engineers in Private Practice, and C. R. Hanes of Columbus, Ohio, a professional engineer in the state highway department and chairman of the NSPE Functional Section Services Committee and director from Ohio, elaborated on the NSPE objections to the ruling.

Van Doren and Hanes explained to the labor officials that survey crew personnel often work interchangably in various capacities, sometimes including inspection of the work of the contractor, and that for high level performance the employees must be qualified far beyond the concept of "laborer and mechanic." The NSPE representatives, accompanied by Paul H. Robbins, NSPE executive director and Milton F. Lunch, NSPE legislative counsel, also told the officials that the application of the ruling would cause hardship on the employees who are often paid on a salary basis and receive benefits as salaried employees. Van Doren explained that it is often most economical to have highly paid engineers work on survey crews during busy periods. Under the Davis-Bacon act the minimum rates are expressed and must be reported on an hourly basis, although the employees may be paid on any basis which conforms to the minimum hourly rate. If the hourly rate is based on the prevailing salaries of relatively highly paid personnel, it was noted, the rate will be exhorbitant for lesser skilled perons employed under the same job classifications.

The Labor Department officials said their ruling emerged from a California union petition supported by some engineering and surveyor employers. The NSPE spokesmen explained that the California situation was unusual in that surveying operations are highly unionized, a situation not true in the rest of the country. It was also noted that there are major differences in operation between a unionized operation under which employees usually work only in a single classification and a nonunionized situation in which there is considerable flexibility in the assignment of engineering and survey personnel. Van Doren pointed out, for example, that it is sometimes more efficient to put an engineer on an important survey job whose pay scale is quite high even though he may act as head rodman. The Labor officials said in such

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cases they would not regard highly paid engineers as within the ruling, even though doing the same work for limited periods of time as others who maybe covered by this "ruling." Their main interest, they said, is to protect the wage scale of the true mechanic or laborer, and they will not be concerned with professional employees. To the contrary, however, they added that the law makes no distinction on the basis of individual qualification, but its coverage is based on the work being done. As a general rule, the government officials will apply the principle that a professional person loses his exemption if more than twenty per cent of his time is spent in nonprofessional duties.

The Labor officials admitted that survey crew coverage was a new field for them and they expected to move slowly in its application, both as to coverage and in ascertaining the prevailing area rate for the various classifications of work. Consulting engineers and surveying firms would be well advised to keep careful and accurate records of hours and rates of pay on all future work within the Davis-Bacon Act's coverage. Information on prevailing salaries and wages for survey crew personnel are invited, the Labor spokesmen said, as an aid in establishing the area prevailing rates. The Labor officials stated they would give consideration to any further information which NSPE desired to submit supporting their contention that field party personnel were not laborers or mechanics. The NSPE representatives requested the Labor Department to keep an open mind on its determination to implement its ruling and be willing to reconsider or modify it as actual field experience might indicate the ruling to be incorrect or impractical of operation in a situation considerably more complex than is apparently understood by the Labor Department at this time.

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Final Regional Meeting Held in Boise, Idaho

The sixth and final regional meeting for consulting engineers for 1960 was held in Boise, Idaho, recently. As in previous regional meetings, the proceedings were planned and presided over by the regional vice chairman of the Functional Section, in this case Western Vice Chairman Earl C. Reynolds, Jr.

Among topics discussed by the consultants present was the possibility of subregional action by various state functional sections and consultant groups. It was pointed out that the Western Region is exceptionally large and that a correspondingly greater divergence of problems and interests might make informal cooperation at the subregional level desirable in many instances. It was agreed, however, that the regional concept of organization offered great possibilities in advancing programs not as easily handled on the national level. It was hoped that the increased communication made possible by regional cooperation would eliminate some of the duplication presently seen hampering consulting groups in the Western Region.

Agreeing with the consultants present at the other five regional meetings, the consensus was that additional financing for programs of the national functional section could best be handled at the state level rather than by direct requests for contributions from the national section.

Other matters receiving attention were:

- **Free engineering and ethics**—Concern was expressed over numerous offers of free engineering by national concerns in national publications. Various methods of dealing with the problem were discussed.

- **Public relations**—The importance of effective public relations for consulting engineers was stressed. It was pointed out that the functional section concept makes it possible to move quickly in combating misleading public statements and in presenting the views of consultants.

- **The Davis-Bacon Act**—The recent Department of Labor ruling applying the prevailing wage requirement of the Davis-Bacon Act to survey crew members was discussed. The general opinion of those present was that the ruling seemed reasonable and that NSPE would not be justified in undertaking extensive action to reverse this ruling.

- **New Model Law**—Participants unanimously opposed the corporate practice provision of the model law recently adopted by the National Council of State Boards of Engineering Examiners and endorsed by the NSPE Board of Directors.

- **Surveying**—A motion was passed that the group adopt the position that land surveying be considered professional work directly related to professional engineering.

Corporate Tax Status Determined by IRS

The Internal Revenue Service has published a final set of guidelines to be used in determining what qualifications an association must meet before qualifying for a corporate tax status. Publication of the rules follows after almost a year the announcement of a proposed rule which has allowed time for interested parties to make comments.

In issuing the new regulations, the IRS elaborated upon previous court decisions which held that an association of professional practitioners may qualify for corporate tax status provided it has more of the characteristics of a corporation than of a partnership. Previous to the court decisions, the IRS had published no formal regulations on the subject, and the new rules are aimed at reducing confusion over the issue.

Internal Revenue says there are six major characteristics generally found in a pure corporation, which, taken together, distinguish it from other forms of organization. These

are: (1) associates, (2) an objective to carry on business and divide the gains therefrom, (3) continuity of life, (4) centralization of management, (5) liability for corporate debts limited to corporate property, (6) free transferability of interests.

In deciding whether an organization is more like a corporation than a partnership, the Internal Revenue Service has set up definite guiding rules. Since two of the corporate characteristics, associates and an objective to carry on business and divide profits, are common to both corporations and partnerships, neither will be considered in the determination. Of the four remaining characteristics, an organization must have at least three to be considered as more nearly resembling a corporation than a partnership. For example, an organization having continuity of life, and limited liability, but which does not have centralization of management or free transferability of interests, will not be allowed corporate tax status.

In addition, says the IRS regulation, an organization cannot meet its requirements if the members sign an agreement which contradicts state law. If partners in an association sign an agreement that only certain members have the power to bind the organization to an outside contract, they ostensibly satisfy the requirement of centralized management. But if, under local law, an outsider with no knowledge of this agreement may hold the organization liable for the acts of an "unauthorized" partner, then the IRS test for centralized management is not met.

Although professional organizations may qualify for corporate tax status even in states not permitting corporate practice, it should be noted that not every group will benefit from such an arrangement. The most important advantage in being treated as a corporation by the Internal Revenue Service is the right to establish tax deductible pension plans for "employee" partners. However, corporations are subject to "double taxation"—one tax on corporate profits and another on individual income—while members of a pure partnership are only taxed on individual income.

California Court Supports Engineer

A California appeals court has upheld the finding of a lower court that an engineer who cannot be proven deficient in his knowledge and use of techniques common to his profession may collect his fee even though the client is not completely satisfied.

The engineer was engaged to prepare plans for grading, streets and sewers, to make construction and field surveys and to perform other engineering functions for development of a subdivision. When a subdivision lot was lost because earth involved in a cut and fill expanded instead of shrinking in accordance with the engineer's estimates, the defendent property owners refused to pay for his services.

Quoting from another decision, the court concluded, "The services of experts are sought because of their special skill. They have a duty to exercise the ordinary skill and competence of members of their profession. . . . Those who hire such persons are not justified in expecting infallibility, but can expect only reasonable care and competence. They purchase service, not insurance." (Bonadiman - McCain, Inc. v. Snow, 183 A.C.A. 56, 1960.)

Sacks to Draft Building Code for Philadelphia

Samuel I. Sacks, a consulting engineer and attorney, has been named to make a final draft of a new Philadelphia Building Code.

Barnet Lieberman, commissioner of licenses & inspections, and chairman of the mayor's committee for revision of the building code, said the final document will be sent to city council which must approve the standards it sets for safe construction within the City. It is scheduled to replace the existing eleven-year-old building code, and establish regulations for newer materials and construction methods.

The final code will contain material from the original research draft prepared by the Committee's former engineering consultant, Harry R. Eitzen, and incorporate changes recommended by technical subcommittees.

(Circle 5 in Readers' Service Dept.)

'Unfair Practice' Charges Against Sperry Withdrawn

An unfair labor practice charge placed against the Sperry Gyroscope Company at the request of the Sperry Engineers' Association has been withdrawn by the NLRB regional director. The action, which amounts to a dismissal of charges against the company, is subject to approval by the NLRB General Counsel.

Immediately following the September decertification election, lost by the union, EA officials filed a request for a new election with charges that voting engineers had been unfairly pressured by supervisors immediately prior to voting. Subsequently, the union filed an unfair labor practice charge alleging that the company had unlawfully encouraged the formation of an employee decertification committee, and had paid employees for time spent on the decertification drive.

On the basis of the union allegations and a preliminary investigation the NLRB issued a formal complaint and scheduled a hearing to determine the validity of the two charges. Before a hearing could be held, however, later investigation and negotiations with the company resulted in the withdrawal of the unfair labor practice complaint by the Board's regional director. A published company statement, drawn up in negotiations between the NLRB and the company, declares in effect that the company did not engage in the alleged unfair labor practice and does not intend to do so in the future.

With the unfair labor practice charge thus withdrawn, there is now no chance that the entire decertification proceedings may be invalidated, as could have happened if the NLRB had upheld the charges after a hearing. However, the union allegations of improper coercion of voting employees must still be investigated before the NLRB will issue a formal decertification of the Engineers' Association as bargaining representative. In the event the NLRB upholds the remaining union charges against the company, it may either invalidate the votes affected, which observers feel would not change the election results, or it may direct that a new election be held. If the charges are not upheld, the decertification will become official. In any event, the NLRB withdrawal of the unfair labor practice complaint is expected to speed the final resolution of the dispute, which otherwise could have been delayed for several months.

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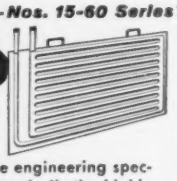

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Purdue Takes Survey of Engineering Graduates

Purdue University has recently published the results of a survey made of students, faculty and alumni of its engineering school which revealed several significant attitudes held by members of the profession on registration, membership in professional societies, and salaries. The results were based on a return of 4,415 questionnaires.

Fifty-three per cent of the civil graduates hold registration, but of the alumni as a whole, only 25 per cent of those surveyed were registered. A definite upswing in registration has been noted beginning with the class of 1946. The highest incidence of registration was found among graduates working in the construction field (51 per cent), with the lowest (16 per cent) showing up in research and development.

Membership in professional societies was felt to be a requirement for professional status by 37 per cent of those surveyed. Forty-two per cent disagreed. Thirty-six per cent belong to one professional society, 23 per cent to two or more, with 42 per cent holding no memberships at all.

Union membership is currently held by two per cent of graduates. Fifty-three per cent felt that professional status and union membership are mutually exclusive, while 73 per cent said that most engineers should not join unions.

The most creative engineers, based upon numbers of patents granted, appear to be the youngest. The greatest number of patents were granted within the first ten years after graduation.

Salary level appears to have only slight relationship to class standing at graduation. While doctorate holders report substantially higher salaries than others, those with masters degrees earned little if any more than did those with bachelors. One out of every two graduates with 26 to 30 years experience reported an annual salary in excess of $12,000, one out of ten receiving more than $25,000.

California Plant Rejects Two Unions

A representation election recently held among engineers at Westinghouse's Sunnyvale, California, plant has resulted in the rejection of both contending unions by a wide margin.

Of 233 valid ballots cast, 152 favored no union, 63 were for the independent Sunnyvale Westinghouse Salaried Employees Association, and 18 went to the previous bargaining representative, the Federation of Westinghouse Independent Salaried Unions.

Voting at the same time, a clerical-technical unit of approximately 650 switched its affiliation from FWISU to the Sunnyvale union.

AMA Throws Some Light on 'Moonlighting'

Shorter working hours, growing families and greater emphasis upon a higher standard of living have combined to produce an increase in moonlighting that is causing company managements to dust off their policy making machinery and decide if the phenomenon is good, bad, or indifferent.

A report by Alan C. Filley, assistant instructor at Ohio State University, published in the American Management Association's *Personnel* magazine, predicts a four-day work week within ten years, a factor which he feels is sure to further the multiple job pattern.

Although unions are dead set against moonlighting, less than one-quarter of companies surveyed had any policy regarding the practice. Of these, most took a middle-of-the-road position, reprimanding the employee only if his second job interferred with his regular work.

Filley recommends that companies adopt a flexible policy whereby some could work even less than the anticipated four-day week, while others could put in longer hours without imposing on their employers the burden that overtime now entails.

IRN Report Defines Engineer, Scientist

When is a scientist not a scientist? Answer: When he is an engineer. Dr. John R. Ragazzini, dean of New York University College of Engineering says in *Industrial Relations News* that loose use of labels "science" and "scientists" by news media may be responsible for the drop in engineering school registrations.

The practice of automatically calling anyone engaged in the "glamor" fields a "scientist" causes confusion in the minds of prospective students and steers many away from the study of engineering.

Some of the projects commonly mislabeled as "scientific" are:

- Conception, development and launching of space satellites.
- Development of atomic ships and submarines.
- Development of systems for the peaceful use of nuclear energy.

Dr. Ragazzini says this practice of improper terminology tends to downgrade engineering and overglamorize science to the detriment of both disciplines.

A related editorial in *Chemical Engineering Progress* looks to public education for the answer.

"Engineering must continue to do a guidance job, a public relations job, to guarantee that the public knows what engineers are doing and how important they are economically, that the Government knows how vital engineering is in this present battle of titans, that the students who will make good, happy engineers are kept out of . . . courses that will lead them into being unhappy scientists."

The Economics and Research Branch of the Canadian Department of Labor forecasts an increase of 5.5 per cent in demand for engineers in Canada in the next two years, reports the *Engineering Journal* of October, 1960.

The 1960 biennial survey of requirements for professional personnel in scientific and technical fields drew information from the employers of about 27,000 engineers, 12,500 scientists and about 600 architects.

The expected 1962 requirements for engineers represent increases ranging between 6.8 per cent for metallurgical engineers and 1.4 per cent for geological engineers. The average increase in demand for all scientists is expected to be 4.6 per cent with the range between 9.3 per cent for mathematicians and 2.6 per cent for agricultural scientists. The demand for architects is expected to increase by 6.6 per cent.

Design Engineering Show Set for Detroit in May

The Design Engineering Show, taking advantage of the opening of Cobo Hall, will move to Detroit for the first time in 1961. The exposition and the concurrent conference will take place May 22 through 25, sponsored by the American Society of Mechanical Engineers.

Both show and conference are devoted to the research and development aspects of new products of all types. Materials and component parts for virtually every kind of manufactured product, from everyday household items to space ships, will be shown.

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Struggle to Register City Engineers Waged in Chicago

Allegations by a Chicago alderman that more than 50 per cent of the city engineers who are required to be professionally licensed are occupying their positions improperly has received prompt and effective follow-up action by the Chicago Chapter, Illinois Society of Professional Engineers. Through statements, press interviews and testimony before the finance committee of the Chicago city council, the chapter urged a complete investigation and the adoption of sweeping changes in present procedures for hiring of engineers.

The alderman's charges, subsequently verified by the Chicago Chapter, revealed that less than half of the city engineers who should be licensed, actually were licensed and registered as required by state law. Out of 1,585 positions classified as "engineer," 277 were reviewed. Of this 11 per cent sampling, 128 positions require the person to be registered either as a professional engineer or structural engineer under civil service job descriptions. However, of the 128 posts which are required to be filled by licensed persons, only 56 of the incumbents were so registered, indicating that 72 were employed contrary to civil service requirements.

A statement released by the Chicago Chapter declared that the employment of unqualified persons in engineering jobs is of concern to the profession because of the hazard to the health and safety of the public and because it "creates an atmosphere which is not conducive to the efficient use of engineering talent."

Although Chicago's Mayor Daley acknowledged the misuse of engineering titles in certain circumstances, the Chicago Chapter claimed he had been misinformed as to the real problem. "The real problem is not in the use of engineering titles, but rather in the use of nonregistered individuals in jobs where civil service requires engineering registration. This is not only illegal, but also has the effect of down grading those individuals who have played such an important part in the development of our great city. Continuation of this situation could cause some of our finest engineers to seek employment in areas where a more professional atmosphere is present," the Chapter explained.

The Chicago Chapter also presented a statement before the finance committee of the city council through its president, Gerald Marks. Marks told the committee that if the city is going to be able to continue to hold and attract high caliber men for engineering positions, "It is imperative that improvement in the professional engineering employment practices be made. Our city government is entitled to, and should be in a position to secure the very best engineering talent that is available."

He added that efficiency and economy in government operation cannot be achieved unless the personnel are fully qualified for their positions through education, training and experience. "This is fundamental in the case of engineers because of their responsibility for the design, direction and administration of large and important projects involving millions of dollars.

"We strongly believe that where a professional field is clearly defined by law, the city government should accept and follow the line of demarcation between those who are legally qualified to practice the profession and those who are not. This principle is accepted in the medical and legal professions, but not in engineering."

In answer to reports that the Civil Service Commission is planning to eliminate the registration requirement from job classifications, Marks commented that such action "would be a sham and would be detrimental to the professional status of those engineers who are legally qualified and are faithfully serving the city. It would be stepping backwards and would make one wonder whether the city administration is actually interested in efficient government and technological advancements.

"We strongly urge the committee," Marks concluded, "to take all steps necessary to prevent the payment of funds for engineering services other than to those who are legally qualified under Civil Service and state law."

The Chicago Chapter has been commended for its vigorous efforts in promoting the interests of professional engineers employed by the city, and also for its effective public relations' efforts in bringing this matter to the attention of the public.

Health Service Starts Air Pollution Division

Creation of a new Division of Air Pollution has been announced by the U. S. Public Health Service to consolidate research, technical assistance and training activities in this important problem area. The action is an upgrading of the air pollution engineering and medical programs set up in 1955 to meet the increasing nationwide threat of air pollution.

Surgeon General Leroy E. Burney said the new Division "will enhance and facilitate the efforts of the PHS to assist states, communities and industry in their research and control activities in this expanding field of nationwide public health concern." The Division will

(Continued on page 16)

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(Continued from page 14)

bring together physicians, sanitary engineers, physicists, chemists and other scientists and professional specialists who have worked previously in separate medical and engineering units of the Public Health Service.

A Laboratory of Engineering and Physical Sciences will be established by the Division to study the nature, sources and effects of air pollution on the physical environment, as well as control methods.

BLS Survey on Federal Pay Scales Released

A nationwide salary study, recently released by the Bureau of Labor Statistics reveals that Federal salaries in the professional and management fields, particularly engineering and science, lag considerably behind those being paid in industry for comparable jobs. The BLS survey showed that engineers in industry receive average annual salaries ranging from $6,371 to $14,193, compared to the Government's range of $4,345 to $11,935. Chemists' salaries in industry range from an average of $5,529 to $13,696, compared to $4,345 to $11,935 in Government. Industry mathematicians have an average annual salary of $5,786 to $15,054, compared to the $4,345 to $13,510 Federal salary scale for these positions.

The first annual BLS survey is designed to accumulate information on industry salaries for use in appraising the compensation of salaried jobs in Federal employment. The survey shows salary data for 77 job categories selected from the following fields: engineering and scientific, accounting, legal, drafting, personnel management, clerical supervision and clerical. Salary information was obtained from establishments employing 100 or more persons in 60 metropolitan areas throughout the country. Employment in the occupations surveyed amounted to about 1.1 million, including 247,000 engineers, the largest group of professional employees studied.

Salary information in the survey report is correlated with different work level job categories in each of the employment fields studied. Employees were classified according to occupation and level, with the assistance of company officials, on the basis of uniform job description. The job descriptions are designed to indicate the degree of experience, responsibility and scope of job duties at each level. They were prepared for the most part by the Civil Service Commission, and are translatable to specific pay grades in the General Schedule applying to Federal Classification Act employees. In comparing actual duties and responsibilities of employees with those in the survey job descriptions, extensive use was made of company occupational descriptions, organization charts and other personnel records.

Grade Level	*Industry Average*	*Gov't. Min.*	*Gov't. Max.*
Engineers, I (GS-5)	$ 6371	$ 4345	$ 5335
Engineers, II (GS-7)	7241	5355	6345
Engineers, III (GS-9)	8411	6435	7425
Engineers, IV (GS-11)	9868	7560	8860
Engineers, V (GS-12)	11620	8955	10255
Engineers, VI (GS-13)	14193	10635	11935
Chemists, I (GS-5)	5529	4345	5335
Chemists, II (GS-7)	6447	5355	6345
Chemists, III (GS-9)	7763	6435	7425
Chemists, IV (GS-11)	9496	7560	8860

The survey provides salary data for six levels of engineer positions, six levels for chemists and seven levels for mathematicians, starting with a trainee level of professional work typically requiring a college degree. The six levels of engineer and chemist positions are equivalent to the GS-5 through GS-13 Federal grades; the seven mathematician levels equal Federal grades GS-5 through GS-14.

Reports indicate that the BLS survey might conceivably pave the way for revisions to the Government's system for setting pay, especially for engineers and scientists. In releasing the BLS findings, the White House and Budget Bureau said that the survey information is of substantial value in pointing to the direction which future Federal salary legislation must take if "reasonable comparability" with salaries in private business is to be achieved. "Unless future salary action is in the direction indicated by the survey—namely, less emphasis on lower level pay and more competitive salaries at the higher levels—the Federal Government will be forced to rely at best on mediocre management and professional talent, particularly in the scientific and engineering fields," according to the report.

"Who's in charge here?"

The BLS report played a part in the 7½ per cent Federal pay raise enacted last June. The administration had asked that Congress defer pay raise action until 1961 in order that it could have the benefit of the BLS findings. But Congress refused, and finally approved the pay increase over President Eisenhower's veto. The White House has now asserted that the BLS report "points to the necessity" of creating a Federal Pay Commission, proposed by the President, to study the entire Government salary structure and recommend an overhauling in the methods of setting Federal employee salaries.

NSPE has taken the position that the Federal pay system, particularly as it affects salaries of engineers and scientists, is in drastic need of revision. On numerous occasions, the National Society has proposed its own five-point "flexible" salary program to strengthen the Government's competitive position in the recruitment and retention of qualified engineers and scientists.

Teachers' Salaries Show 14 Per Cent Rise in Two Years

The average total professional income of engineering teachers has increased by 14.7 per cent in the past two years, according to a report by the Engineering Manpower Commission of Engineers Joint Council. The survey, made possible through a grant from The National Science Foundation, covers over 5000 engineering teachers or more than half the total number.

Seventy-seven and one-half per cent of the average total income of engineering teachers is basic teaching salary and the remainder derived from outside professional work such as consulting and research. Since the survey was first made in 1956, average basic teaching salaries have risen 31.1 per cent and income from "outside sources" 11.3 per cent.

Today's average basic teaching salary for engineering teachers in American colleges is $8,534. It is supplemented by an average of $2,479 from outside professional income.

In public institutions the rise in total income (15.6 per cent) was greater than that in private institutions (12.5 per cent) due more to higher outside earnings than to a difference in the rise of basic teaching salaries. Such outside earnings for engineering teachers in public institutions increased 24.8 per cent during the last two years as opposed to only 11.3 per cent in private institutions. The basic teaching salary increase was 13.4 per cent (public) compared with 13.0 per cent (private).

"Salaries and Income of Engineering Teachers—1960" is the title of the report. The survey was conducted in cooperation with the American Society for Engineering Education and prepared for the Manpower Commission by Professor Morris A. Horowitz of the Bureau of Business and Economic Research, Northeastern University, Boston.

The report is an adjunct to a more comprehensive survey of professional income of all engineers, scheduled for publication by the Commission later this year.

H. S. Students Visit California College

A unique preview approach to whet engineering career interest of young science students is being tried at San Luis Obispo, Calif., by California State Polytechnic College.

Forty high school juniors and seniors from all over California, carefully selected with the help of science and math teachers and counselors, were recently all-expense guests of the school for two days for a foretaste of engineering education on the college level.

Though only 40 could be chosen, Engineering Dean Harold P. Hayes said high school science students were so eager for the experience, though it meant sacrifice of two Christmas vacation holidays, that the college received 320 applications by deadline time.

NSF Awards Grants for Science and Math

The National Science Foundation announced today the award of grants totaling about $9,800,000 to 43 colleges and universities to support Academic Year Institutes for science and mathematics teachers. This will be the sixth year of this program, whose purpose is to help teachers improve their subject matter knowledge through a year's advanced study on a full-time basis. Special emphasis is placed in these institutes on the newer developments in science and mathematics.

Approximately 1,500 experienced junior and senior high school teachers will attend the institutes during the 1961-62 academic year. There will also be included in the program about 75 teachers from liberal arts colleges, teachers colleges, and junior colleges.

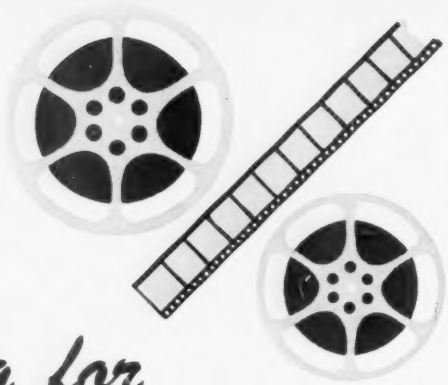
The Academic Year Institutes' program has in its five preceding years helped about 4,800 science and mathematics teachers improve the quality of their teaching by enabling them to keep abreast of the latest scientific developments.

Offical Discusses City Engineering Careers

Careers in engineering with a municipal government offer a dynamic challenge and a sense of satisfaction in rendering community service, according to Frederick C. Righter, assistant director of the Department of Public Service for the City of Miami, Florida. Young engineers and those now in college and universities should certainly explore the municipal field, he suggests.

"If a young engineer has a genuine desire to become a permanent and important part of his community life—and has an interest in the health, welfare and well-being of his hometown or city—then public works engineering offers him unlimited opportunities." Righter feels the process of advancement and promotion through the ranks is faster in a municipal engineering career. "Some men comparatively young in years," he points out, "have reached levels of responsibility that probably could not have been attained in private industry in the same period of time."

NSPE Presents:



"Building for Professional Growth"

Here is a film covering the activities of the National Society of Professional Engineers at the chapter, state, and national levels. A milestone in the NSPE public relations program, "Building for Professional Growth" is a filmed presentation on the values and benefits of Society membership. Activities covered in the film include NSPE efforts in registration; research projects such as the Income and Salary Survey, the Professional Engineers Conference Board for Industry reports; legislative cooperation; National Engineers' Week, and other programs. Also included are scenes from actual chapter, state, and national level meetings.

"Building for Professional Growth" can be shown on any 16mm sound projector. Reservation requests should be made for three choices of dates. Notification of available date will be sent from NSPE headquarters immediately after each reservation request is received.

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Describing the organization of the Miami Department of Public Service as an example, Righter added: "Miami has four grades of engineers, and in order to obtain a position in either of the top two grades a man must have a current Florida registration. Young men awaiting their registration may be employed in either of the first two grades, depending on their background and experience. Salaries range from approximately $460 per month for the starting grade of an Engineer I position to more than $1,000 per month for the top grade of an Engineer IV position.

"Many successful engineers in industry today received their start in municipal, county, state or Federal work," Righter said. "Engineers engaged in governmental work have to become familiar with so many problems aside from their engineering that the experiences so gained are invaluable throughout their careers," he added.

"No doubt, other fields may offer a man greater rewards," Righter concludes, "but there is a certain satisfaction in knowing that you are a part of your community life, and, to me, my years in public works engineering have been interesting, absorbing, challenging and never dull. It is certainly a field that should not be overlooked by young engineers starting their careers."

Frost Heaving Research Prepared for Alaskans

Frost heaving and its costly effects upon man-made improvements in Alaska are engineering and geological problems facing many Alaskans who are building, either personally or professionally, in Alaska.

In order to understand and control these effects, the University of Alaska Geology Department staff and the U. S. Geological Survey recently conducted a study of certain woodpile bridges, of the Alaska Railroad. The results of this research are now available for Alaskans interested in these problems which confront many construction projects in the 49th state.

Strictly Business

Personalities . . . **Bernard Johnson and Associates,** Consulting Engineers in Houston, Texas, recently announced the appointments of **David M. Olive** as coordinating engineer and **Felix W. Stone, Jr.** as project engineer . . . **Bernard Sands** has been named to the newly created position of applications engineer at **Bonfield Associates, Inc.,** Oakland, Calif. . . . **Pierce Hollingsworth** has been appointed manager of the industrial gas cleaning department, Metal Products Division of **Koppers Company, Inc.,** of Baltimore, Md. . . . **Reese B. Lloyd** has been elected president, chief executive officer, and a director of **Warner Company** . . . The appointment of **A. S. Blodget, Jr.** as regional vice president of **Air Reduction Sales Company's** mid-western region has been announced . . . **Rotax Incorporated,** Los Angeles, has named **David H. Thomas** as president . . . **William R. Scherwat** has joined **Engineering Service Corporation** of Decatur, Ill. . . . **The Harza Engineering Company,** Chicago, Ill., has announced the recent appointment of **Franklyn C. Rogers** as chief civil engineer . . . **George W. Land** has been appointed director of engineering services for **Walter Bledsoe and Company** of Terre Haute, Ind.

Mr. Stone

Dictograph Products, Inc., Jamaica, N.Y., has appointed **Harold H. Beizer** as vice president in charge of manufacturing and engineering . . . **The Ferrodynamics Corporation,** New York City, has named **Andreas Kramer** director of research . . . **Keuffel and Esser Co.,** Hoboken, N.J., has named **Elwood E. Parrish** to the post of director of international marketing . . . **Thomas E. Marburger,** vice president in charge of engineering and construction with **Baltimore Gas and Electric Co.,** has been elected a fellow of the American Institute of Electrical Engineers . . . **Paul H. Setzler** has been named vice president and general manager of the **Bell Intercontinental Corporation** of South Bend, Ind. . . . **H. A. Sawyer,** chairman of the board and president of **Lone Star Cement Co.,** has been elected chairman of the board of directors of the **Portland Cement Association,** Chicago, Ill. . . . **John W. Straton** has joined the staff of **Gates Engineering Company** of Beckley, W.Va. . . . **Edwin F. Clark** has been appointed director of highway transportation studies for the Metropolitan New York area . . . **Richard M. Johnsen** has been elected president and director of **The Foundation Company** of New York City.

Mr. Parrish

Richard H. Henry has been appointed vice president and director of export for the **Spray Products Corporation** of Camden, N.J. . . . **Harold P. Valentine** has been elected vice president—international of **The Yale & Towne Manufacturing Company** of New York . . . **Anthony Mauriello** has been named vice president of engineering administration for **Engineers Incorporated** of Newark, N.J. . . . **Wallace Barnes** has been elected executive vice president of **Associated Spring Corporation** of Bristol, Conn. . . . **Charles A. Grim** has been appointed product sales manager of **Crucible Steel Company's** cold rolled specialties division . . . **Clinton B. F. Brill** has assumed the presidency of **Brill Engineering Corpoation** of New York City . . . The appointment of **Edmund F. Martin,** president of **Bethlehem Steel Corporation,** to the board of trustees of Stevens Institute of Technology has been announced . . . **Ernest L. Ward** has been elected president of **Sprague Electric Company** of North Adams, Mass. . . . **Isomet Corp.,** Palisades Park, N.J., has named **George F. Dappert** as general manager . . . **Ward J. Koepenick** and **George F. Burns** have been appointed vice presidents of **Smith-Corona Marchant's** new centralized marketing organization . . . **Modine Manufacturing Company** of Racine, Wis., has named **R. L. Hagensick** as chief engineer of the heating and air conditioning division.

Mr. Mauriello

Election of **William C. Whitehead** as a director of **Networks Electronic Corp.,** Van Nuys, Calif., has been announced . . . **Carl A. Gerstacker,** vice president and chairman of the finance committee of **The Dow Chemical Company,** has been named chairman of the board of directors . . . **John Brinda, Jr.,** has joined the **Remington Rand Univac Military Division** as supervisor of a new reliability training program . . . **Donald C. Power,** chairman of the board and chief executive officer of **General Telephone and Electronics Corporation,** and **Frank J. Nunlist,** vice president of **Worthington Corporation,** have been elected to the board of directors of **Worthington Corporation** . . . **Hans M. Schiff** has joined **Packard Bell Electronics,** Los Angeles, as vice president and general manager of the Technical Products Division . . . **Walter D. Wood** has been appointed vice president for sales and operations of the newly-formed **Farrington Instruments Corporation,** Needham Heights, Mass.

Mr. Brinda

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American Engineer

engineering and designing—closer coordination and less duplication of responsibility would result in better relations between these two fields

THE ENGINEER vs THE DESIGNER

FRIEND OR FOE?

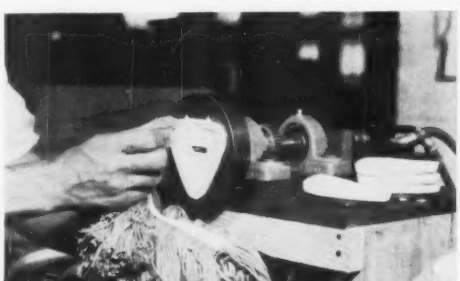
By
JOSEPH PALMA, JR.
Industrial Designer
Palma-Knapp Associates, River Forest, Illinios

I'M just about old enough to remember when industrial designers and engineers were dedicated to nothing so much as wiping each other off the map. I'm sophisticated enough to know that a lot of this is still going on. But we have reached the point now where the designer and the engineer who go around sniping at each other are gaining a reputation as a prime menace. Unless they learn to get along, they should seek another line of work.

That's a tough appraisal, perhaps, but circumstances warrant it. American industry is more dependent than ever on the ability of the designer and the engineer to work as a team, creating products that appeal to customers and that function well after they are sold. Competition among such products has been greater than ever in recent business history, and there is no margin for petty professional jealousies and lingering resentments.

It should be mentioned at the outset that the responsible designer has no more respect for a weak, doting engineer than he does for the fellow who is pompous and domineering. We feel a lot more comfortable on a project guided by an engineer of strong convictions.

This came home to me early in my career when I was called upon to design a wire holder for laboratory instruments. The company engineer simply looked on as I went all out in design. What I produced was a thing of beauty—but my fee, it developed, was greater than the company's small annual gross sales for that product.



In redesigning this mop, a team of engineers and designers replaced the old metal head with plastic, shown above, which eliminated two steps from assembly. Mounting the mop onto the head by the use of a plastic band, shown in the center picture, assured a better fit and eliminated the need for tying it on. In the picture far left is the redesigned mop, the result of the first major change in 25 years which was a saving in both material and labor costs.

I needed an engineer then to give me my come-uppance. Of course, I finally got the message—when it was too late.

I raise this point mainly to answer those who feel the designer is trying to usurp the authority of the engineer. Nothing could be farther from the truth, so far as the truly competent industrial designer is concerned. He has enough on his hands with his own professional problems.

Perhaps the greatest immediate need is for a recognition of just that fact—that each of us, the designer and the engineer, has a clear and important job to do. Each must do his own job well, understand the problems of the other, and work with the other to iron out mutual problems.

Back in 1947, I formed a partnership with an engineer, J. Gordon Knapp. We had an excellent understanding at the time and high hopes for our future together—hopes which, by the way, have been realized many times over.

But we both remember well an experience we had very early in our relationship. We had been called in to talk to a prospective client. Shortly after the meeting opened, however, J. Gordon Knapp began to talk. "This," he said, "should be done this way. This should be eliminated. This should be added, but it should be placed here and not here . . ." and so on.

We did not get the account—and that may have been a break. My partner had a lot of good ideas. He's an excellent engineer. But once he stepped into the intricacies of design, he began to look like a novice swimmer splashing around in the English Channel.

When we got back to our office, of course, we had what we may diplomatically refer to as an appraisal of our mistakes. We settled the matter there and then. We haven't had a serious disagreement since.

When a client wants to talk design, I do the talking.

But there are other engineers in our lives. From time to time, they lead us to a project and immediately tell us exactly how we are supposed to do our job. Perhaps the best example of that in my experience is the one concerning the electric knife sharpener.

The head of the company, an engineer, invited us to do a re-design—and then he told us that there were certain areas into which we were not permitted to trespass. He told us what kind of switch we should use, how the slots were to be arranged for knives needing sharpening, what kind of material to use. He even told us how to shape the thing—rectangular, so that the housewife could set it upright in her cabinet, saving kitchen space.

We turned out a sharpener of which neither of us could be proud—and we said as much. Buyers and other merchandising experts in a subsequent housewares show said the same thing, adding that an electric knife sharpener, retailing at $10, was ridiculous to begin with.

Our client did not agree with them. He was driven by the idea that every housewife was wailing the same lament: "Give me a sharp knife!"

He called us in and said, "We must have made a mistake. Please try it again."

We went into the job a second time—concerned as always with the functional characteristics of the sharpener, but not caring much whether it stood on end in the cabinet or not. We knew that its ability to stand on end would not sell it. We wanted a product that would sell.

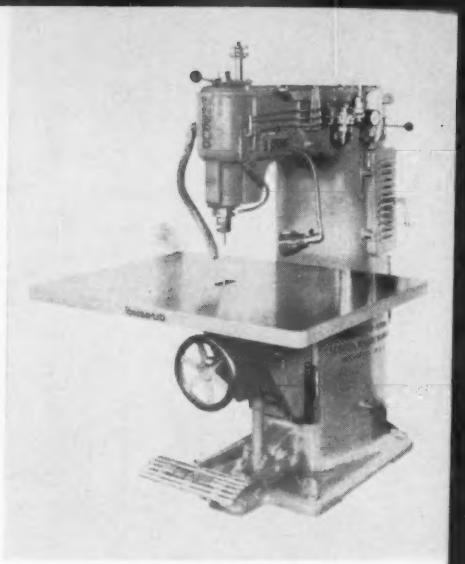
We designed a white and black article that the housewife would not want to hide in her cabinet. On the store shelves, it became an instant hit—not at $10 but at $12. It began selling as a gift item, moving along in impulse purchases. Since that time, our client has sold more than 3,000,000 electric knife sharpeners, even though the price has climbed towards the $15 mark.

The knife sharpener has been copied several times by other manufacturers. They still haven't come up with one that stands on end in the cabinet.

It's just possible that this was a case in which an engineer had his misgivings about designers as dreamers charting flights of fancy, as creative persons who need to feel the realities of a solidly engineered harness. His misconception cost him time in the housewares market and an industrial design fee in the creation of a flop.

If the engineer thinks of us as dreamers, fine! We do dream. But we're tougher than Colorado rock when we put those dreams to the

The redesign of this mycrodial produced cost reduction and sales advantages. The old design (above) is made of die castings with drawn metal shroud. With the new product only the mounting plate is die cast. New dials are plastic with numerals and calibrations moulded of separate colored plastic for permanence.



Working with engineers of the company, Palma-Knapp undertook to redesign this router in an effort to simplify production and to give the machine a more modern design.

The newly designed router achieved simplification of main casting, better rigidity, greater ease in assembling, reduction of machining time, and improved ease in servicing and operating.

test of good performance and good merchandising.

Comparatively, the engineer is conservative. He'll say, "Paint it grey, George"—feeling certain he has made a minor decision that can't go too far wrong. But we dream around it a little. Maybe grey is best after all. But we're not afraid to try it in buff or green or pastel blue or white or ebony black. We'll look for a brand new color if we feel it is going to add something to the product.

One of our clients came to us with a case for a photographic exposure meter. It was made of leather—always had been. Leather cases are strong and important looking. We were told: "Take the leather case and fix it up so it will sell."

We finally came up with a case, but it was not leather. It was plastic, and it looked good. The cost of production dropped 75 per cent; sales climbed 90 per cent. We are now on excellent terms with the engineers at that company.

Sometimes, it seems to us that we should kick up a little more fuss than we do when we disagree with a client's instructions. Certainly it would have been to the client's benefit in a couple of cases I can relate.

First is the one dealing with an organ, a sweet sounding musical instrument engineered by a man who had an odd dislike for brass. "Do what you please," he said, "but don't put any brass on it." We obeyed; the product fell flat. A cabinet manufacturer took the job, ignored the no-brass injunction and produced a beautiful organ model. The company welcomed it with whoops of joy, and the brass-fitted organ is still selling well.

Another example is that of a manufacturer of commercial communications equipment. One of its machines had to be made in such a way as to permit the operator to see into the works. For this purpose, a pane of glass was placed at front and side. We pointed out that the same purpose could be served by using plexiglass corners, thus avoiding the cost of sheet metal or die-casting cover structure. The answer: Plexiglass corners would give a distorted picture; we can't use it.

How simple it would have been for us to produce a model with plexiglass corners! But that would have been the same as arguing with the client. We did not feel we should argue.

The ending to that story? It's a happy one. The company finally realized that plexiglass corners would do the trick nicely—many months and many dollars later.

These are the things that make life puzzling, but interesting, to the industrial designer and the engineer who gets embroiled with him. But the process of "getting together" is unfolding. Eventually, that beautiful goal of mutual understanding and mutual respect will have been achieved to the enormous relief of a lot of people who make their living by selling products.

One of the best examples of the play and interplay of forces in this designer-engineer tug-of-war is the automobile industry. One day an auto firm has the best engineered and poorest selling product in America. Then it has a sleek job that sends sales soaring—but it keeps limping back and forth between the owner's garage and the service department of the dealer from whom it was purchased. The engineers went back to work, battling to restore the company's great engineering reputation, but newly respectful of the fact that no-one will buy the car that isn't beautifully sculptured as well as economical on maintenance.

This drama, of course, is being enacted in other automobile factories, too—designer and engineer working in closer and closer proximity to each other, to management, to the market with which they must eventually reckon for their bread and butter.

Many engineers come to us and say, "We know there are mistakes being made in our working together, but it's only natural. We don't know much about you. What are some of the things we ought to avoid in working with an industrial designer?"

For purposes such as this, I happen to have a list of "Don't" items. Here are a few of them:

DON'T stuff yourself at the outset with mental blocks. Don't start with the assumption that you know what the designer can and cannot do. Don't take it out on the next man because you've "tried it before, and been burned." Don't strait jacket the designer by making him live up to "the way we did it ourselves in the past."

DON'T show the product to the prospective designer and ask, "What can you do with it?" First, design consultants don't make decisions that fast. Second, you are asking him to give you a design opinion—and that isn't something he can give away, unless he is independently wealthy.

DON'T expect the prospective designer to put on a spectacular show in his presentation. Some do; some don't. Many of those who do are excellent; many who don't are just as excellent. One fellow I know works up to the point where he begins waving his arms wildly, loudly quoting poetry and even banging his head on the wall. I am told he is a good designer, and that is his way of telling his story to a prospect, but his manner of presentation does not prove his pro-

fessional merit.

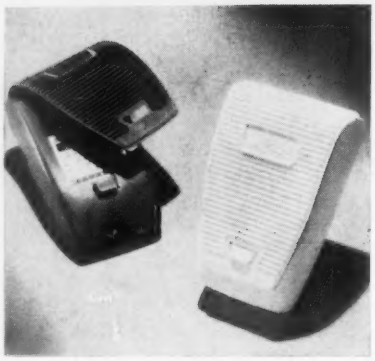
DON'T look for miracles. The designer can do a lot with the appearance and general workings of your product, but don't expect him to compensate for flaws in your sales organization.

DON'T put a stop watch on the designer. He needs time. He wants to "noodle" your problem for a while. He wants to experiment. He is not clairvoyant, so he must rely on mental and physical sweat until his professional sense says, "This is it." When he arrives at that point, he usually knows it—and he tells you.

DON'T let the secretary or the wife be your judge of the product's market appeal. Nothing is more frustrating or depressing to a designer than the client who opens the conversation with, "Now, I was discussing your design with the girls in the office. . . ."

DON'T assume the designer is only a cosmetician. Real design is more than skin-deep. Fine sketches and air-brush renderings can be overwhelming, but they do not answer some of your more basic questions.

DON'T assume that the industrial designer's sole satisfaction comes from the fee. He's as anxious as the next fellow to get paid for his services, but he is not fully satisfied until his work hits the ultimate critic—the customer for the product. There are many instances where a designer plunged in free-of-charge to correct a mistake that showed up after the design was completed and tools were being prepared for production.



A 75 per cent cut in cost of production and a 90 per cent increase in sales accompanied the redesign of the exposure meter and case shown above, which demonstrates the advantages of not placing cumbersome restrictions on the designer before he starts a project.

That, of course, is just a partial list of "don'ts." I'm sure many of my professional colleagues will read this far and exclaim with alarm, "Why does Palma stop there?" I'll just have to tell them that I think I've made the point that there are many potential clients with built-in negatives. In view of the fact that industrial design costs them money, they might approach the experience with an inspection of their own attitudes and the extent to which those attitudes prevent their getting the most for their money.

The "do" list is never as long as the "don't," and it isn't half as readable. Nevertheless, there are some clear and important positives. The firm about to take on an industrial designer should keep them in mind.

First, you should make every effort to explore the reputation of your would-be designer. Talk with his other clients. Find out how long he has been retained by other companies. Insist on seeing "before" and "after" examples of his previous work, and if possible, a detailed accounting of what success or failure the redesigned products of the past had in the market.

Second, use all your skill as an interviewer to determine how the designer thinks. You want to make certain he has strong opinions without being pigheaded. You want a man whose ideas are flexible, but you don't want a yes-man.

Third, think of your design venture as an investment. This is bromidic in a way, because every firm dealing in services makes the same appeal: We're not a speculation; we're an investment. But the designer has a unique claim to that distinction, since he must take in his hand the most basic elements of the company's reputation—its product, how it looks, how it is packaged, how it works, what impression it makes before and after it is purchased.

The search for an industrial designer is not a bargain hunt. The good and conscientious designer—fortunately, he is the great majority—has set fees, some lower and some higher than others. But the differences are negligible when you consider what you are buying, what you are risking, what you are providing in the way of challenge and opportunity for your company.—**End**

About the Author . . .

Mr. Palma, Jr.

Designer Joseph Palma, Jr. is a partner with engineer J. Gordon Knapp in Palma-Knapp Associates, industrial design consultants, of River Forest, Illinois. Palma earned his bachelor of science degree in architecture from Armour Institute in 1932. He designed displays for Chicago's Century of Progress in 1933. He was with Montgomery Ward's product design department from 1934 to 1938, serving the firm as chief designer in 1937 and 1938. He has been in private design service since 1939, and is a professor of industrial design at the Art Institute of Chicago.

AE Meetings of Note

Society of Automotive Engineers—Annual Meeting, January 9-13, Cobo Hall, Detroit, Michigan.

Society of Plastics Engineers—Annual Technical Meeting, January 24-27, Willard Hotel, Washington, D. C.

American Institute of Electrical Engineers—Winter General Meeting, January 29-February 3, New York, New York.

American Institute of Mining, Metallurgical and Petroleum Engineers—Annual Meeting, February 19-23, St. Louis, Missouri.

American Institute of Chemical Engineers—National Meeting, February 26-March 1, Roosevelt Hotel, New Orleans, Louisiana.

NSPE State Presidents' Conference—April 13-15, Union Club, Memorial Center, Purdue University, West Lafayette, Indiana.

FROM WASHINGTON

BY
MILTON F. LUNCH,
N.S.P.E.'s Legislative Counsel

National Goals ►

First reaction to the report of The President's Commission on National Goals has been largely critical on the primary ground that the findings and recommendations are too general. Commission member George Meany, president of AFL-CIO, in a supplemental statement charged the "report marches right up to the issues, always faces them boldly, then often turns away, without making the necessary, if sometimes unpopular, proposals for attaining the very goals the Commission believes necessary."

Such criticism, however, seems based upon the mistaken idea that the Commission's function was to lay out a detailed blueprint for legislative, executive and financial action in the years ahead. Rather, the President's charge to the Commission was to "develop a broad outline of coordinated national policies and programs," and to "set up a series of goals in various areas of national activity." Implementation of the stated goals will obviously require extended study and debate over details.

Among the more significant findings and recommendations of interest to the engineering profession are the following:

- A higher proportion of the gross national product must be devoted to education; education is primarily a responsibility of the states; enrollment in professional schools should be increased; teachers' salaries at all levels must be improved; graduate school capacity must be approximately doubled; Federal aid to higher education must include increased scholarship and loan funds.
- We should allot a greater proportion of our total effort to basic research; Federal aid to higher education should include support of research; the total program of basic research in industry and other institutions should be increased.
- Technological change should be promoted and encouraged as a powerful force for advancing our economy; the Federal Government must strengthen its supervisory and contracting procedures and must avoid undertaking impracticable and unnecessary projects "and thereby wasting scientific and engineering manpower;" both government and industry need to encourage that combination of engineering and management talent which can master our increasingly complex technology.
- There should be a stepped up urban renewal program; effective regional planning is essential.

The Commission's report, plus sixteen supporting chapters by distinguished observers of the American scene, has been published by Prentice Hall as *Goals for Americans* and is available in most bookstores at $1 in paperback edition.

Research and Education ◄

A panel on basic research and graduate education of the President's Science Advisory Committee, headed by Glenn T. Seaborg, chancellor, University of California, states: "We do not believe in any artificial separation between basic and applied research or between science and engineering. The fact that a scientific advance is useful does not make it unscientific."

The panel report, "Scientific Progress, the Universities, and the Federal Government," makes the argument repeatedly "that the process of graduate education and the process of basic research belong together at every

possible level. The two kinds of activity reinforce each other in a great variety of ways, and each is weakened when carried on without the other," the panel adds. To this is added the further contention that "research" and "teaching" are "essentially inseparable" and "there is a radical error in trying to think of them as different or opposite forms of activity."

Stating its basic premise that "basic research and graduate education, together, are the knotted core of American science, and they will grow stronger together or not at all," the panel says, "The Federal Government, by its varied missions and the size of its financial commitments, is the most powerful single force in this whole field, while the universities are the natural holders and custodians of the knotted core."

In its recommendations, the panel urges that in the next fifteen years the United States should seek to double the number of universities doing generally excellent work in basic research and graduate education. Better salaries, increased time for research, rising support for facilities and equipment, and modernization of curriculum are needed in undergraduate colleges to attract more talented young people to science as a career, the report states. The Federal Government is urged to increase support for basic research and graduate education and to extend such support over long terms and for broad objectives. It is also urged that Government grants and contracts for research permit the institutions to charge full cost of research performed for the Government—including overhead.

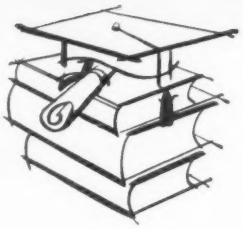
Symington Report ►

For engineering and scientific activities, the most significant part of the Symington Report on reorganization of the Defense Department is the recommendation to centralize research and development under an Under Secretary of Defense for Weapons Systems. This proposed office would be responsible to the Secretary of Defense for the complete cycle of weapons' development, procurement and production, and also for construction and installations, including bases, housing and depots. The activities would be managed through three directorates:

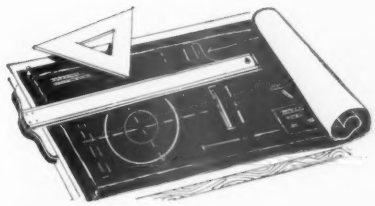
1. The Directorate of Research and Engineering, which would take over the functions now carried on by the present Director of Defense Research and Engineering, and in addition would be responsible for the activities now handled by the Science Advisory Board, the Research and Development Policy Council, the Defense Science Board, and the OSD Ballistic Missile Committee. In addition, the Advanced Research Projects Agency would be absorbed in the new Directorate.
2. The Directorate of Procurement and Production, which would be responsible for all procurement and production functions.
3. The Directorate of Facilities, which would be responsible for all activities regarding facilities and installations, including responsibility for the planning and construction of facilities for research and testing of weapons, industrial-type facilities for weapons' production and maintenance, facilities for weapons' operation and use—such as missile and space vehicle launching installations—and noncombatant facilities, such as on and off base housing.

The advisory committee, headed by Senator and former Air Force Secretary Stuart Symington, proposed to the President-elect a sweeping reorganization which would retain the military services, but eliminate the departmental structure for the Army, Navy and Air Force. A chairman of the Joint Staff, advised by a Military Advisory Council of senior officers from all services, would be the principal military adviser to the President and Secretary of Defense. Military operations would be through three unified commands: strategic, tactical and defense (continental defense missions). All appropriations would be made to the Secretary of Defense and certain categories, such as research and development, would be put on a multiyear basis, instead of a one year justification and appropriation cycle.

President-elect Kennedy received the report without committing himself to it. If recommended to Congress in the form presented, or only slightly modified, it will be considered by many as a long step toward the one service concept and thereby certain to provoke extended debate.



MORE HUMANITIES OR MORE ENGINEERING?



By

CLAYTON H. STIMMEL

Instructor, Civil Engineering Department
Ohio Northern University

PROGRESSIVE educators and leaders of industry who teach and hire engineering students are reappraising present engineering curricula. When new recommendations are made from the reappraisal, the formal education of engineers may receive the most significant uplift since the inception of engineering education one hundred and forty-one years ago.

Evolution of engineering as a true professional vocation is long overdue. Top notch engineers who accomplish great feats of modern progress are unwittingly and unfairly classified with men who are merely technicians because of "granddaddy" laws and antiquated customs.

The table on the following page compares pertinent data of the vocations that comprise the "professions."

Defeatists who propound that a four-year program (or less) adequately prepares a student to become a professional engineer need to study seriously the implications of the above table.

Have We Reached a Turning Point?

The nuclear dilemma has refuted the philosophies of history. After sizing up the turn of events of our lifetime compared to the echelons of time we must admit that overnight our complacencies of the past have graduated into underrated challenges.

Whereas engineering until approximately 1951 was repetitious of the preceding decades, engineers who will graduate from now on must begin to design and practice in terms of conservatism and economics. Engineering methods will require closer scrutiny to stop the plundering of our natural resources. Engineers will be required to deal with the social and economic impact of the "engineering revolution" now in progress.

Are the Present Educational and Professional Standards Adequate?

Implications noted in the accompanying table indicate that calling engineering a profession is a misnomer. *Webster's New Collegiate Dictionary* lists the three learned professions as theology, law and medicine. In terms of law, medicine and dentistry, the title of "professional engineer" should be reserved for those engineers who acquire a post baccalaureate education; those engineers with less than graduate study should only be called technicians.

The foregoing statement will provoke wrath among the rank and file of the present engineering profession. It is designed to do so. (A good offense is the best defense.) There is far too much complacency within the profession. The table shows that there are far too many practicing and licensed engineers who are 'riding the shirttails' of the profession. If a lack of educational standards has allowed deterioration of the profession to evolve, it is time to resort to remodeling the educational framework.

What Will Make an Engineer A True Professional?

To be realistic in the evaluation of engineering education we must forget our associations with each minor phase or branch and think of engineering in its entity. A correlation might be a gear with many teeth. The teeth shall represent the many branches while the wheel represents engineering as a whole. As the material in a gear must be of high quality, likewise the engineering profession is no better than the material of which it is composed. The final shaping of the branches or teeth for integration of harmonious meshing can only be accomplished on material that is of a high calibre.

It is true that a drastic change takes place in a youth during his college training. This fact is a realization of the goal of any university,

namely, "To bring the student into the atmosphere and under the influence of imaginative scholars." A scholar in this sense is one who has engaged in advanced study and acquired knowledge in some special field. Let no man be guilty of claiming that a student will receive as much education in a three or four year college course as the students who take a five or six year course.

There is also a certain lack of unity among older engineers and recent graduates. Let me cite an example: A recent graduate in civil engineering took employment with a state highway system. He was assigned to a survey party and was the only graduate engineer on the team. Was he exposed to even a sprinkling of responsibility? No, he was rodman, chairman, cut brush and probed for tile while *technicians* ran the "gun" and kept notes. This type of subjugation of engineering graduates defeats the purpose of educators. Their aim is to keep the student on an inclined plane of learning, starting at the bottom and grading the student upward at a steady acceleration so that upon graduation the student wants responsibility. When an employer does not cooperate in delegating supervised responsibility, he is defeating the accomplishments of dedicated instructors. Promotion of professionalism needs help in the field as well as in education.

More Humanities or More Engineering

This writer will not weigh the differential characteristics of more humanities or more engineering by implicating that one phase requires more emphasis than the other. A proper balance between the two is necessary to produce a versatile engineer. A properly indoctrinated engineering student will have more of both humanities and engineering than a student who merely wants a degree.

It is a well-known fact that we cannot be proficient in everything. Pick out any one of the following subjects as controversial subject matter for an engineer and this writer will write a page on why an engineer should be versatile or on speaking terms with it. The list includes English, speech, report writing, creative writing, history of western civilization, ethics, philosophy, psychology, business administration and economics.

The various branches of engineering will need progressively better trained participants. The possible necessity of the use and reuse of our discharge of sanitary systems, the possible necessity of enclosing our populations in fission-free containments, further conquering of space travel, communications and habitation are rapidly approaching challenges for present and future engineering graduates.

	Medicine	Dentistry	Law	Engineering
First Licensing Law	1760	1841	1890	1907
First College Course	1765 (U. Pa.)	1840 (Balt.)	1799 (W.&M.)	1819 (Norwich)
2-4 Plan Adopted[1] *	1918	1937	1921	19??
Prof. Society Accreditation	1907	1909	1921	1936
National Board of Examiners	1892	1883	1931	1920
Founding of Professional Society	1847 (AMA)	1859 (ADA)	1878 (ABA)	1934 (NSPE)
Licensed Individuals	239,500	103,600	262,300	260,000
Practicing Individuals	207,240	92,000	254,700	500,000[2]
Membership in Professional Society[3]	180,700	82,400	97,000	53,544

[1] 2-year pre-professional followed by a 4-year professional program.
[2] Estimated number eligible for licensing.
[3] Membership restricted to legally qualified individuals.

*Period covered is 1959-60. Presented by J. E. McKee in paper *Long Range Goals in Civil Engineering* at Civil Engineering Education Conference, Ann Arbor, Mich., July 8, 1960.

About the Author . . .

Mr. Stimmel

Clayton H. Stimmel received his degree in civil engineering from Ohio Northern University in 1960 and had previously been engaged mainly in agriculture, but also delved into work for the Department of Agriculture as both a conservation aide and an engineer's aide. He is a member of the Ohio Northern student chapter of the Ohio SPE, the student chapter ASCE, and the American Society of Testing Materials. He has also worked with the Ohio state highway system and the Hardin County Engineer.

The subject of more humanities or more engineering is controversial within the engineering profession. If each and every student knows exactly the job he will accept upon graduation, it might be very wise for him to specialize his training as early as possible. Since he seldom knows the exact branch to pursue, the student is normal perhaps if he "hopes for the best, expects the worst and takes what comes."

In the present highly competitive selection of engineering graduates (Caterpillar hires about two per cent of the graduates it interviews), versatility and scholastic standing are assets for the graduate. For the better jobs, six, eight and ten hour batteries of tests are commonplace. The tests cover psychology, philosophy, composition, grammer, sports, current events, math, physics, chemistry, engineering problems and coordination testing. A person who has not taken such a battery of tests has not been exposed to the futuristic method of selection of employees. This writer believes that a more extensive education in both humanities and engineering will better shape the engineering graduate to utilize his inborn and environmental talents for the best benefits to himself, his profession and his country.—End.

Tomson Treats Legal Aspects of Engineering and Architectural Practices in His New Book

Judge Bernard Tomson is a noted commentator on legal aspects of architectural and engineering practice, being the author of *Architectural & Engineering Law*, published in 1951. Now he has given the professions a new work, "It's The Law," (Channel Press, N.Y., $7.50) based on his monthly columns in *Progressive Architecture*.

The primary orientation of the work is toward architecture (the preface is by the distinguished architect, Edward Durell Stone), but it is nevertheless a valuable reference work for professional engineers in private practice, particularly for those whose work associates them with architects. In some respects the author treats too briskly some of the more complicated problems of engineer-architect relations, corporate practice and others. This may be due to his desire to cover too wide a territory—delving into matters of principal interest to construction contractors. It might have been more fruitful to limit the work to the direct interests of architectural and engineering practice with a separate volume for the problems in construction activities, zoning and building codes, among others.

Despite these limitations, however, a consulting engineer or architect will find a wealth of data and the particularly rewarding experience of having court decisions, laws and regulations explained in a clearcut nonlegalistic style. The chapter on licensing laws raises some pertinent questions about their strength and warns of the care needed in amending the laws in order to prevent their weakening through compromises dictated by political or practical necessity.

It is unfortunate that the corporate practice chapter was written before the significant action of the National Council of State Boards of Engineering Examiners in adopting a revised model law which deals with that perplexing question. Judge Tomson presents both sides of the argument and states that "the central and fundamental issue in this continuing debate is whether it is possible to have a corporate organization in which control of professional activities remains in the hands of professionals and is not subordinated to some objective of the corporation that may be inconsistent with the duties owed to public and client." He indicates there is not much merit in the idea of having a requirement that a majority of the board of directors be licensed professionals because the professionals on the board of directors may disagree, still leaving the controlling decision to others on the board.

In other chapters the author deals somewhat briefly with establishing architectural and engineering fees and dealing with the government. The discussion of standards of professional practice is somewhat more valuable, including the troublesome engineer-architect jurisdictional question.

The fairly extensive material on forms and problems of contractual agreements revolves around the standard forms of agreement published by the American Institute of Architects, which are included as an appendix. One sample form of agreement between architect and engineer is included, with no indication of its source, but before this form is used the consulting engineer would do well to compare the standard forms adopted by NSPE, covering the arrangement to be made between the parties on a percentage basis, multiple of direct personnel expense or professional fee plus reimbursement of expenses.

—Milton F. Lunch
NSPE Legislative Counsel

By

EARL C. KUBICEK, P.E.
Illinois Institute of Technology

Photo—Anderson

LEONARDO DA VINCI: CIVIL ENGINEER

ONE spring day in the year, 1451, a young Florentine notary named Pietro di Ser Antonio da Vinci, was staying at the villa of his father near the little Italian village of Anchiano and met a young serving girl known only to us as Caterina. They fell in love. The match did not have the blessing of young Ser Pietro's family as they planned a match for him more suited to their position in society.

Pietros' father, Ser Antonio da Vinci, with due regard to the family position, arranged a marriage for him with Madonna Albiera di Ser Giovanni Amadori whose family, like the da Vincis', occupied a position of prestige and respectability.

He conveniently arranged for Caterina to be married to one of his workmen in the village of Vinci, Accattabrighe di Pietro del Vacca. Caterina's son was called Leonardo and she gave him into the care of the da Vinci family.

In the governmental archives of the city of Florence is preserved the notice, "Leonardo, son of the above mentioned Pietro, born out of wedlock, of him and Caterina, now the wife of Accattabrighe di Pietro del Vacca, da Vinci."

Young Leonardo's grandmother, Monna Lucia, undertook to raise him and lavished care and affection upon him. His grandfather looked askance at the whims of his grandson and was displeased by the fact that he was left-handed for it was generally felt by all that this was an affliction and indicated an evil omen.

At the age of thirteen young Leonardo was taken from the care of his grandparents by his father, Ser Pietro, and brought into his own home where the youngster remained until 1469 under the eyes of the best tutors his father could obtain. Ser Pietro was very proud of his first born's marked genius and took some of his drawings to his friend, the great sculptor and artist, Andrea Verrocchio who promptly accepted Leonardo as a pupil.

A large part of Verrocchio's more important commissions were sculpture but his technical ambitions and interests were boundless. It is easy to see how his gifted pupil, Leonardo, with his marked bent for scientific as well as artistic matters, was sympathetic to every mood of his master and how he would take a great interest in every technical problem that presented itself.

Photos from *Leonardo da Vinci* by Antonina Vallentin, The Viking Press, Inc., 1938. Reproduced with permission.

Verrocchio's studio was frequented by some of the most famous personalities of the day and thus it was possible for young Leonardo to receive instruction in many things other than art.

One who came was Benedetto dell' Abbaco, a famous teacher of mathematics in Florence in the fifteenth century. Another was Argyropoulos, "Messr Giovanni Argiropolo" styled by Filelfo as one of the most learned Greeks in all of Italy. He had been welcomed to the country by none other than the great Cosimo de' Medici. His lectures were attended by Leonardo until his twentieth year. Argyropoulos' translations of Aristotle's works into Latin were probably the basis of Leonardo's knowledge of these treatises.

Another friend of Verrocchio was Paolo del Pozzo Toscanelli, who had spent most of his life in Florence where he had gained great eminence in mathematics, astronomy, geography and medicine.

It was Toscanelli who, in 1474, fourteen years before Columbus' first voyage of discovery, had written to Columbus urging his interest in finding a western route to Asia, priming him with scientific deductions as to the practicability of such a route and by using the glamorous descriptions of Marco Polo sought to fire his latent ambitions.

Leonardo knew Amerigo Vespucci, who was his senior by only one year, and it is reasonable to believe that he also came to know other members of this great Florentine family.

Both of them knew Leon Battista Alberti, noted architect, mathematician, sculptor, philosopher, physicist, and astronomer who died in Rome in 1472—the year that Leonardo was admitted to the Florentine Guild of Painters. Alberti's linking of science with art and practice with theory is closely akin to that used by Leonardo.

Ser Pietro was prospering. Once a notary of Vinci he was now notary to the Signorie of Florence and a family was most important to him.

The first wife of Ser Pietro died without issue and he soon remarried but his second wife, Madonna Francesca also died without providing him with another heir.

His third marriage provided him with a large dowry. This wife, Margherita di Guglielmo, took a dislike to his firstborn, Leonardo, probably because she presented Ser Pietro with two sons whom she would naturally be anxious to have inherit the family mantle rather than having it shared by a son born out of wedlock.

Leonardo's father finally secured a commission for him from Lorenzo de' Medici but Leonardo failed to please the great man, mainly because he was unable to extend the fawning adulation that Lorenzo demanded of all in attendance upon him.

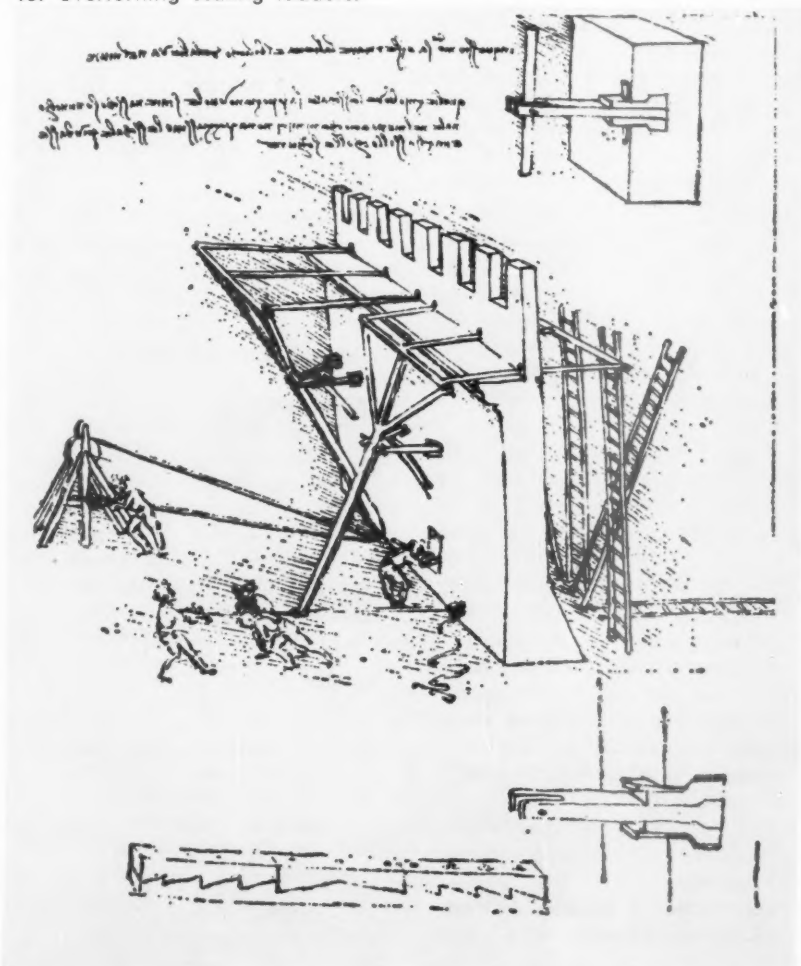
Then Leonardo invented a silver lute of many strings. This caught the fancy of de' Medici, who proposed that da Vinci journey to Milan and present it as a gift to the Duke of Lombardy, Ludovico Sforza Moro. Leonardo in 1482 was thirty years of age.

It is quite evident that Leonardo's ambitions were of sterner stuff than the strings of the lute he played.

He wrote to the Duke: "Most Illustrious Signor, having studied and weighed the works of present day inventors of military machines, I have found that they contain nothing which would distinguish them from those found in general use. And therefore I am taking the liberty of addressing Your Highness, in order to discover to you the mysteries of my art."

He went on, in some detail, to propound his ideas—to be carried out on a consulting basis—for a new method of demolishing, without the aid of bombards, any fortress or castle if its foundations were not

One of da Vinci's plans for weapons included this drawing of beams for overturning scaling ladders.



Photo—Fleming

hewn out of stone. He also wrote of his plans for subterranean passages and minings, laid rapidly and noiselessly beneath moats and rivers.

There were also proposals for covered wagons which could impinge into enemy formations and could not be resisted by any power. He had many other suggestions and ideas and concluded his proposal to the Duke by saying, "During times of peace I hope to please Your Highness by architecture, by the erection of private and public edifices; and by the construction of canals and aqueducts."

The Duke, exiled from Milan, had been permitted to return to that city in 1479 by the Duchess Bona who was ruling as regent for her son, Gian Galeazzo, following the assassination of Galeazzo Maria Sforza in 1476.

Unfortunately for her she underestimated Ludovic's ability for intrigue. She was powerless when he proclaimed Gian Galeazzo, at the age of twelve, fully capable of ruling in his own right although he gathered the actual power into his hands as the benevolent uncle. He assumed full ruling power as Duke in 1494 upon the death of Gian.

Ludovic did commit a grave error in statesmanship when he permitted Gian to marry Isabella of Aragon for by so doing he put the King of Naples into the position of assuming a direct interest into the proceedings and affairs of Milan. In lending support to Charles VIII of France in his campaign against Naples, he also put himself in the untenable position of having to allow the latter's forces to pass through his territory, thus opening their interest again to their hereditary claims against Milan.

The ambitious Duke, in spite of his being engaged in almost continuous warfare with some one or other, was also interested in carrying out grand plans of an entirely different nature within his own territory.

He first called upon Leonardo's services for the proposed monumental statue of Francesco Sforza.

A natural catastrophe, a plague which visited Milan in 1484 and 1485, gave him the opportunity to effect a reconstruction of the capital. Plans that Leonardo submitted for his interest included provisions for a double system of high and low level roads.

The upper road levels were intended for pedestrian traffic while the lower levels were intended for vehicular traffic. Both levels were to be interconnected by means of steps. He also submitted other proposals for a canal system within the town whereby the canals would serve as lower level roads and effect easy delivery of goods, etc., directly to the cellars of the houses.

It is interesting to note that Leonardo, in his recommendations for reconstruction, felt that the width of the new streets be that of the average height of the houses along them to insure the necessary provision of light and air for each house. This same provision was later adopted by the London County Council in laying out their new streets.

The Navoglio Sforsesca was to connect the Sesis with the Ticino River and by branching out into a network of smaller canals, irrigate the meadows, fields and the pasture lands of the Lomellina. Ludovic was most anxious to have this project proceed and succeed.

While Leonardo was called in as a consultant on this project, he did not carry the requisite title for the position, nor was he even called ducal architect. He was still the court musician. His talents were in demand by Ludovic but the latter, always strapped for funds, was probably able to avail himself of these talents at less money by such a device.

Da Vinci was retained at Vigecano where construction work on the plains of Lomellina consisted of a series of terraces in the bed of the Ticino River. The general impression was that such measures would preserve the fertility of the lands of Lombardy.

Ludovic had come to depend most strongly upon Leonardo's abilities, both scientific and artistic, and when the marriage of Gian and Isabella in 1478 came to pass, he requested Leonardo to create something that would be of an extraordinary nature to conclude the ceremonies.

This was probably one of Leonardo's most spectacular achievements. He created a revolving stage for the pageant "Paradiso" written by the Court Poet Bellincioni. Sforza wanted a spectacle worthy of his wealth and position and Leonardo, calling upon his artistic ability as well as his broad scientific knowledge and imagination, gave him just that.

It may be that the spectators, upon first arriving at the theater site, were both puzzled and disappointed at the sight of a great dark, drab structure of wood, plaster, and cloth that greeted their eyes.

They were intrigued and enchanted, however, when the pageant got underway and the great mountain before them slowly opened in half and revealed a celestial dome, gilded and sparkling with a myriad of twinkling stars, illuminated by innumerable candles that burst simultaneously into flame.

Huge mannequins, operated by men inside them, personified the planets while music, produced from instruments created by da Vinci, filled the air. This was truly the paradise that all present had always envisioned.

Underneath "Paradise," and to either side, was placed the nether regions they had always imagined complete with brightly blazing

(Continued on page 39)

About the Author . . .

Mr. Kubicek

Earl Charles Kubicek is presently director of alumni relations and placement at the Illinois Institute of Technology. He graduated from Armour Institute of Technology in 1933 with a degree in architectural engineering, but has been active in public relations since that time, and has been at IIT since 1946. A registered professional engineer in Illinois, he is a member of the Illinois SPE, the Army Transportation Association, and the Midwest College Placement Association. Also a member of the Illinois State Historical Society since 1945, Kubicek is able to speak on both engineering and historical data. His articles have appeared in many known journals.

Professional Profiles

Professor William H. Goetz of the Engineering Experiment Station of Purdue University is shown with a view of the lab in which he both conducts and supervises research in bituminous mixtures and materials.

One of the definitive characteristics of a profession is a continuing body of communicable knowledge which is passed from older members to neophytes. The most important individual involved in this transfer of knowledge is the teacher, who must not only pass on the old but also acquire and pass on the new. We salute one such person this month as a professional profile.

Professor William H. Goetz, presently a research engineer in the Purdue University Engineering Experiment Station as well as a professor of highway engineering, began his engineering and teaching careers when he graduated from the University of Michigan in 1936 with a B.S. in chemical engineering. Following two years of service with the Michigan State Highway Department, he continued his education at Purdue while also a member of the staff of the Joint Highway Research Project in the School of Engineering in Lafayette, Indiana. Since 1943 he has been in charge of research and graduate programs in the bituminous section of the Project. Courses under his teaching are in the areas of bituminous materials and bituminous mixture design.

As a result of the quantities of research that have progressed under Prof. Goetz's direction, he has been able to offer the field much new literature. He has authored or co-authored some forty technical papers, and was recently an associate editor of the *Highway Engineering Handbook* published by McGraw-Hill.

In addition to his research he has found time to actively participate in professional organizations, making his contribution to the profession even broader. Besides being active in the National Society, he is an associate member of the Highway Research Board, a member of the Department of Materials and Construction and chairman of the Bituminous Division, as well as being a member of the Board's committee on training highway engineering personnel and road surface characteristics.

As a personal member of the American Society for Testing Materials, he works on committees for paint and varnish materials, skid resistance, road and paving materials, and on the effect of water on bituminous coated aggregates.

In recognition of the accomplishments he has made in his extensive research, Prof. Goetz has received several noted awards. Among these have been the best paper award for the 1956 meeting of the Association of Asphalt Paving Technologists. He has also been runner-up for this honor on two other occasions. He most recently received the Richard L. Templin award at the 1960 annual meeting of the American Society for Testing Materials.

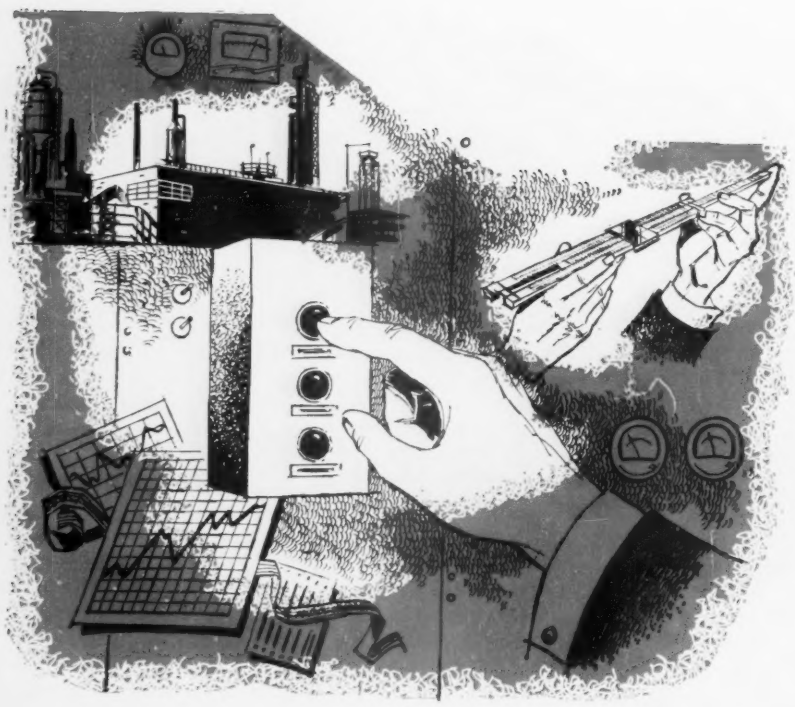
Under his direction some 65 graduate students have received advanced degrees, of whom about half have contributed research and data which has advanced the area of bituminous materials and mixtures.

Prof. Goetz resides in Lafayette with his wife and three daughters. He is a member of Sigma Xi and Phi Lambda Upsilon.—**End.**

By
WALTER V. MEDENICA, P.E.
Army Ballistic Missile Agency

At the Crossroads of Engineering Education

A Voice for Specialization



SINCE the first Sputnik hit the sky and the American complacency, an almost constant discussion is going on among people from all walks of life, and particularly among engineers, about our educational system. The majority apparently agrees that our education, or rather lack of it, carries the better part of responsibility for our second place status in certain technological sciences.

It seems that at the present time, we are coming out of the talking stage and going into the doing stage, as far as the engineering schools are concerned. The latest reports speak of "revolutions in the engineering curricula.' According to these reports the future four-year engineering curriculum will give the student a broad knowledge of many technological fundamentals; it will give him a start in many fields, it will give him but a starting platform from which he will have to specialize later as an employee of a generous employer who will train him and pay him at the same time—train him in his own schools, or give him the chance for post-graduate work at some other school, which is very nice, of course, very idealistic indeed.

One way or the other, the future B.S. will have to continue his studies, his concentrated studies, for several more years, since with his B.S. he is not going to be an engineer yet, not even within the most liberal definition of the term.

It appears that the idea of broad general knowledge is gaining momentum. One can see that in the appearance of many engineering handbooks which cover everything from architecture to nuclear physics, or to put it more correctly, which *touch* on everything from architecture to nuclear physics. These are relatively small books of a few hundred pages.

In a recent article of an engineering periodical a strong statement was made saying that an engineer who is a "pure" civil engineer is out of date. Luckily, there were some extenuating explanations farther down in the same article to the effect that it was the engineer-manager who had to know electronics, automation,

physics, and what have you, besides civil engineering, in order to be able to make his team do the job properly.

The sigh of relief from thousands of pure, simple, mortal civil engineers, who were reading this article, resounded in the atmosphere, after reading the latter extenuating explanation. After the soul-ripping inferiority complex into which the first statement of the article, about being out of date (finished, fired, dead), has plunged them, the explaining paragraph was a soothing balm on the wounded pride.

"Oh, them, the engineer-managers, they have to know all that, not me. I am only an engineer, not a jack of all trades."

And the pure civil engineer felt much better again, because, in addition to the extenuating explanation, he remembered a recent article by Vice-Admiral Rickover (AMERICAN ENGINEER, January, 1960) in which this critic of our times said the following: "Engineers must be particularly careful not to lose their recently acquired professional status inadvertently. This will usually happen when they accept managerial positions. In such positions the engineer-manager becomes a member of an administrative hierarchy where he must submit to lay superiors. His engineering knowledge then becomes incidental, on a par, let us say, with proficiency in a useful foreign language. He functions as an administrator and is no longer a professional engineer."

This is not an attack against the engineer - managers. God bless them, we certainly need them (not too many of them, but some we do need). It is the engineer-manager, and only him, who might be forced to be a "jack of all trades." An engineer-manager whose professional knowledge is a thin coat over a large area can accept and live with this fact. He can accept it as the price he has to pay for his personal success, limit his work to administration, coordination, representation, dealing with clients, and similar activities, and accept the professional opinions of experts in his team without fight.

The majority of our engineer-managers are of this realistic type, but not all of them. There is the other type who feels insecure, because of the shallowness of his technical knowledge, and in trying to cover this up he is arrogant and rude; he does not recognize theoretical analysis as an engineering tool because he is not proficient in it; he can do everything in half the time just by guessing; he is tense, irritable, and dissatisfied.

This attitude of inferiority is by no means a monopoly of engineer-managers. The lack of professional knowledge can make any man in any position and in any profession insecure and dissatisfied.

A well organized group of engineers, led by an engineer-manager with a broad and superficial technical knowledge, can produce fine work, if the other men in the team are experts in their special fields. But we could not possibly expect very much from an engineering outfit where all the engineers know something of everything, and, consequently, not much of anything. (It should be well understood that we are not speaking about the genius-type engineer but the other 99 per cent.)

It might sound as too far fetched (and we hope it *is* too far fetched) to mention in this connection the fact that about 17 million Americans (10 per cent) are mentally unstable, and 5 million (3 per cent) are alcoholics. That amounts to 13 per cent among us who could not take any more—for one reason or the other—the complexities of the modern life. (This figure does not include the innumerable ulcer sufferers.)

The percentage of college educated among the mentally unstable is in proportion very high. One of the reasons for that is certainly the heavy burden of training, work and responsibility that is placed upon that section of our society.

The intention to increase that burden, as we are obviously trying to do since the beginning of the Sputnik era, reminds one of that Serbian story about the gypsy and his horse.

It seems that the gypsy in question was trying, for reasons of economy, to teach his horse how to eat less. He started by reducing the horse's diet gradually every day, until finally, he stopped feeding him altogether. After a few days the horse died.

This could be the end of the story, as far as our point is concerned. But there is a punch line which should be mentioned for the sake of the story itself.

Standing over his dead horse, the gypsy was contemplating sadly: "What a pity. Just at the time I weaned him from eating, he had to die."

According to the latest statistics the enrollment of engineering students dropped 11 per cent in 1958, and an additional 3 per cent in 1959. In the era of the split atoms and rocketry, at a time in which we are literally at the threshold of space, where the engineering profession has achieved a glamorous and adventurous reputation it never had before, the young people do not want any part of it.

Amazing, unexplainable!

And yet, one of the reasons for this peculiar attitude of our high school graduates might be the deluge of words since Sputnik I, telling us how inadequate our engineering schools are, and how much more we should require from the engineering curricula. The deluge was probably justified to a certain degree, but the pendulum seems

An engineer-manager might need to be a "jack of all trades," but the engineer who is starting out can more easily find his place in the profession if he specializes in one or two areas.

to have swung to the extreme. We are apparently saying now that we should make the engineering training so tough that nobody can pass it. The above mentioned statement, that a civil engineer has to be a technological encyclopedia as well, fits into this line.

A human being, like any other force, chooses preferably the path of least resistance. Very few people feel their profession is an inspirational and compulsive vocation, which they follow against any odds. For the great majority of others the profession is only a means of making a living, and sometimes—a career.

A high school graduate of the latter type (realistic, normal), in choosing the path of his future life, will consider the effort required to attain a certain goal, and he will try to find an optimum between a high goal and low effort. The goal is usually financial reward and security, and the effort training curriculum and time.

If the same high school graduate, in gathering information about various trades and professions, arrives at the conclusion that effort in the engineering training is in disproportion with later rewards, the chances are he will decide for business administration, for medicine, or for driving a locomotive, where the invested effort pays better dividends.

This should, by no means, be interpreted as the desire to lower the engineering standards in order to attract more engineering students. That could amount to professional, and in the long run, to national suicide. What we could do is to find an effective compromise, from which the student, the engineer, and the society would profit.

Such a compromise seems to be possible. It could be titled "Specialization From the Beginning" or "The Training of an Expert."

We can not lower the requirements in fundamental subjects (mathematics, mechanics, statics, etc.), we can only raise them, since a house with poor foundations is bound to fall, no matter how solid is the superstructure. But we can eliminate those fundamental subjects which have none, or very little connection, with a specific field. A structural engineer, to mention one example, will hardly ever have any use for thermodynamics, machine-design, electrical design, chemistry, economics, law, etc. These subjects should be left for post-graduate work of the talented, the eager, and the ambitious, while the Bachelor's degree should produce a well equipped engineer in one specific field.

Hiring an engineer who is particularly well trained in one line of the profession will save the new employer much time and expense usually spent in additional training.

Furthermore, we can narrow down the field of possible future activities for the benefit of all concerned. Chances are probably better than ten to one that, if a newly graduated civil engineer starts his first employment, say, as a structural engineer, he will remain in the structural field all his life, and he will hardly ever have any use for sewage disposal plants, water supply, railroads, surveying, and all the other branches and subbranches of the vast field of civil engineering.

Why then waste valuable time and effort on something that we shall never need? Why not use that time to acquire the knowledge in one particular field, and fully absorb that field?

How many civil engineers are quite familiar with all the methods of analysis for indeterminate structures; how many can handle vibration and blast problems, prestressed concrete, composite design, plastic design?

The answer is: very few. And yet, these are rather common problems of present day civil engineering, or shall we say, of structural engineering.

The large field of civil engineering does not allow the student to go very far into any of its many branches. The graduate engineer comes out of many a school with a thin layer of knowledge spread too far. He starts his career in one particular field of civil engineering, and soon, in many cases, he finds his training inadequate to handle the problems.

An increase of post-graduate students was reported lately. This might reflect the devotion to the profession, and a strong desire for higher learning, but more likely, it reflects a necessity, the naked need for making a living. It reflects the failure of the pre-graduate training, which should make the new engineer capable of solving the problems he encounters in his first employment.

But his pre-graduate training was not adequate, and he is not capable of solving the problems, consequently he is forced to continue his scholastic training if he wants to become an engineer (which he is not yet). And he is going to do that, if he has the strength and willingness to do it, that is to say, if he belongs to the minority of the talented, the eager, and the ambitious. But he is not going to do so, if he belongs to the majority of those who prefer to raise a family after four, or five, or six years of college, to play with their kids, and watch television after office hours, rather than go to school again. These are going to stay half-baked engineers all their lives, and they are not going to contribute very much to their profession—which is an unnecessary waste of the human potential.

The pyramid of knowledge of these engineers (nominal engineers, that is) is a low one, with a very wide base; it is an unfinished pyramid with the top part missing.

The volume of the pyramid of knowledge is limited by time and human limitations, but we can take the same volume, and by reducing the base to a reasonable minimum, make a high pyramid out of it, with its pointed peak

piercing up through the clouds of ignorance and frustrations.

And by absorbing fully one field, no matter how small the field, the new engineer will experience the deep satisfaction and confidence of knowing something well, and of being capable of working creatively and independently.

The sciences of today are mushrooming with the speed and size of a nuclear explosion cloud. According to available estimates our knowledge now doubles every fifteen years. To keep up with all of it is a Utopian idea. Specialization seems to be the only answer, if one wishes to achieve a higher degree of excellence.

The objection could be raised that too narrow a specialization would produce one-track minds, which is correct. That danger does exist. The answer to it is that our high schools could raise their standards considerably, and give the future engineer the required general education, which he can broaden and deepen later in the form of personal or post-graduate studies, if the willingness and need for it exists within the individual.

Besides, we live in critical times, where the very existence of our society is threatened, and our time requires that all of our engineers be as capable and effective as possible in their respective fields. Without trimmings, we cannot afford them today, and perhaps, for generations to come, which brings us to another aspect of the problem.

In the last few years, beginning, apparently, with the Korean War, the United States has suffered a great loss of prestige in the world. One reason for it is, as essayed above, the educational and scientific negligence of yesteryear, and, in the present days, the panicky jump into the other extreme—the desire to do too many things at once.

Another reason for the loss of our prestige is our awkwardness in handling foreign affairs. Some recently published books, like "The Ugly American" by Lederer and Burdick, and "What's Wrong with U.S. Foreign Policy" by Sulzberger, point very vividly to this deficiency of ours.

We apparently do not have the know-how required for the job of international politics. We do not even recognize that job as one that requires training and education. The consequence of that attitude is the great discrepancy between our good will, our efforts, and the money we spend on one side, and the results of our international work on the other.

Very often these results are openly negative. We achieve the very opposite of what our intention was; rather than gaining prestige we lose it in spite of our good will, our effort, and our money.

Because somewhere in Sarkhan (to use the same fictional country as in "The Ugly American") the American in charge simply does not know the history and the geography, the language and the culture, the customs and the mentality of Sarkhan, and therefore, almost every statement of his, and every action, is either an insult for the Sarkhanese, or a cause for their ridicule.

The engineering projects are part of the cold war; see the Aswan Dam story. And the cold war seems to be the only possible peace of our time. Which we do not have to call the cold war; we might give it a better name, say, the Peaceful Ideological Competition, and learn to live with it.

American engineers are traveling and working abroad and by that fact alone they are acting as American ambassadors, whether they want it or not. The people abroad will take them as such and they will judge the American people and our way of life by the impression the individual American has made on them. Consequently, our engineers should be prepared for that job, which means, alas, additional studies, additional work, and additional time and energy requirements. It means the world geography and history, current events, foreign languages, etc. It also means the light and breezy flavor of the liberal arts, which is a welcome change on the "dry" technological horizon.

The necessity for foreign languages seems to have become obvious since the Sputnik experience. We were told repeatedly, after the shock had tapered off, that Sputnik should not have surprised anyone who has followed the open Russian scientific and engineering literature. The advanced state of Russian science was evident to anybody who cared to read their publications. Apparently only very few did care before. Now, at last, we should get wise and care more. And we should have time to do so, if we are not burdened with academic luxuries.

But all this not before one has become an engineer, de jure and de facto.

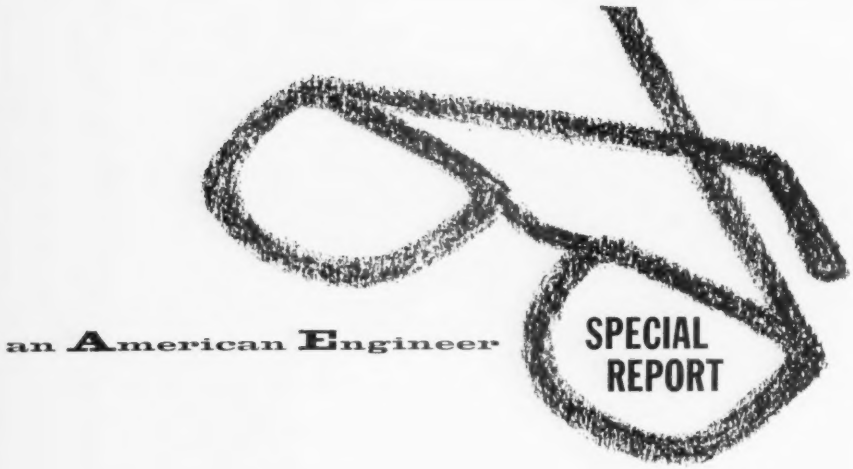
Except for one foreign language that should be followed continuously through high school and college (pre- and post-graduate work), all the subjects that are not indispensable for the student's particular field of studies (including world geography and history, current events, other foreign languages, etc.) should be part of the post-graduate options, allowing the full utilization of the student's time and energy in achieving a high degree of excellence in one field, *before* the Bachelor's degree is bestowed upon him.

And after he has searched the depth and height of that one field, and after the graduation has produced a capable and self-confident engineer, then, and only then, is the time to broaden the field, if willingness and energy are available.—**End**

About the Author . . .

Mr. Medenica

Walter V. Medenica, P. E., of Huntsville, Ala., was born in Yugoslavia and moved on to Austria and Germany before coming to the United States in 1952. He received his master's degree in civil engineering in 1950 from the Technical University of Dormstadt, West Germany. A registered engineer in Pennsylvania, Georgia and Alabama, he is presently with the George C. Marshall Space Flight Center as a special assistant to the director of the test laboratory. He is a member of the North-East chapter of ASPE.



Professors' Conference on Teaching Engineering Held at Penn State

One of the paradoxes of American education is the widespread criticism for too much methodology on the secondary school level while many educators show increasing concern for the almost total lack of improved methodology for teaching on the college level. Many teachers of undergraduate subjects have had no formal instruction in the principles of learning, in developing lesson and course plans and objectives, and in evaluation of their own instruction. In fact, there is a widespread belief that concern for the methods of education is not consonant with creative teaching at the college level.

To consider this and related questions in college teaching, the College of Engineering and Architecture of The Pennsylvania State University recently held an institute on effective teaching for young engineering teachers on the University Park campus. It was given under the auspices of the American Society for Engineering Education and the Engineers Council on Professional Development. It was supported by a grant from the Ford Foundation, and teachers from 50 universities attended as group leaders or participants.

Purposes of the institute were to provide training in the fundamental principles and use of effective teaching methods; to orient young teachers to their professions as educators; and to encourage research in methods to improve learning.

The entire two weeks of intensive study supported the view that mastery of his subject is still the most important attribute of a good college teacher. There was equally strong evidence that knowledge of the principles of learning could add immeasurably to the creative powers of the teacher. Applied widely in the engineering colleges, the application of learning principles could significantly upgrade the quality of students now turned out. (On this point, there was general agreement that today's engineering students were the best the colleges had ever trained, but that increasing complexity of knowledge demanded additional improvement.)

It was pointed out that engineering teachers had a dual role. They are first engineers who must set a high professional standard for students at a pliable age. Equally important, they are professional teachers who, if they perform this role properly, lead the student into a useful life.

Eric A. Walker, president of Penn State and of the American Society for Engineering Education, opened the Institute with a challenge to improve the quality of engineering teaching. He noted that many professors had had no more training in teaching than "having listened to both good teaching and bad."

"When many of our teachers have never even seen a learning curve or a forgetting curve, I wonder if we are really paying attention to our main business," Dr. Walker commented. He said, however, that ASEE and its members were probably doing as much as any other professional association to improve the quality of teaching.

Group leaders of the institute were drawn from psychology and education as well as engineering. The various methods of presentation—lecture, discussion, recitation, teaching machines, proper use of visual aids, etc.,—were thoroughly dissected.

B. R. Teare, Jr., dean of engineering, Carnegie Institute of Technology, and past president of the ASEE, described the principal objectives of engineering education as: learning root knowledge and basic principles with real understanding, learning to solve new problems, and learning how to extend knowledge. He added two objectives that are sometimes overlooked—learning to cummunicate with clarity, precision and interest and acquiring an understanding of the economic, social and human aspects of technical work. He quickly noted that the last objective is a difficult one to achieve, and that perhaps no more than three could be achieved in a single course.

W. J. McKeachie, professor of psychology, University of Michigan, stressed the value of the discussion method in developing concepts or teaching problem-solving skills because of the advantages of immediate feedback by the learner. He suggested a combination of lectures and discussion as the best system if the goal included the imparting of information and the development of concepts.

Robert M. Gagne, professor of psychology at Princeton University, in five one-hour lecture-discussions summarized the classic findings of research into the learning process. Ralph W. Tyler, executive director of the Center for Advanced Study in the Behavorial Sciences at Stanford, Calif., built a model to optimize learning. It consisted of a curriculum structured to provide

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fires caused by colored lights and wind-blown strips of silken cloth. Appropriate discordant musical sounds accompanied the sights. Surrounding the whole was an artificial stream upon which floated flower-bedecked boats filled with singers.

Leonardo knew well the acoustical value of water and his picturesque water setting made clearly audible the music and sounds that he intended to reach the audience.

The reign of Ludovic was drawing to a close and was effectively ended in 1499 with the reentry of the French troops into Milan after the battle of Norvara. He tried feverishly to organize a resistance movement but to little or no avail. He finally had to retreat to Innsbruck where he hoped to secure assistance from Emperor Maximilian. He had left the field in command of one of his captains, Bernardino de Corte. However, he was forced to surrender his forces to the invaders and thus ended the rule of the Sforzas in Milan, substituting for it the rule of the French.

The archers of Gascony used the plaster model of Leonardo's great monumental statue of Sforza, which had not as yet been cast in bronze, as a target and they destroyed it. Leonardo felt that something of himself went with it and he left the city with several friends to go to Venice.

Meanwhile, the first great Turkish admiral, Kemal-Reis, had defeated the Venetian fleet under Grimani in a series of sea battles which took place off the island of Sapienzo. When the Turks finally retreated from the country they inflicted as much damage as they could to the land.

Leonardo proposed to the Council of Venice that his services as a consulting engineer might be useful to them. He suggested that future attacks of this nature could be prevented by flooding the country at such a time in much the same manner that the Dutch were to do later. He proposed erecting a great dam, with sluices, on the Isonzo River at Gorizia.

He wrote: "I am of the opinion that it is not possible to construct a defense in any other spot which could be of such universal efficacy as one over this river.

"Having, O most Illustrious Lords, thoroughly examined the nature of the river Isonzo, and having ascertained from the inhabitants of the district that from whatever part of the mainland the Turks approach the gates of Italy they must arrive at this river, for this reason I am of the opinion that even over this river it is not possible to make defenses which will not, in the end, be ruined and destroyed by the floods."

He could offer to the Council ample proof of his ability to devise such sluices and devices for he had been commissioned to do this in Lombardy in irrigation schemes in the Comellina and in connection with the Martesana Canal.

He was also a member of the commission which, under direct order of the Signoria of Florence, studied ways and means for diverting the course of the Arno River in order to cut it off from Pisa.

Da Vinci remained in Venice until the latter part of April, 1500, and then went back to Florence. Ludovic had, after his loss of Milan, raised a mercenary army of German Swiss and, with the help of a revolting populace, defeated and driven the French invaders from his city.

The French, however, regrouped themselves and, also with the help of German Swiss mercenaries, had again taken up the campaign against Sforza. The mercenaries, on both sides, refused to fight each other and Sforza was left without adequate support. He was captured and the hopes of the Sforzas to return to power were ended.

Art again claimed the attention of da Vinci but suddenly the picture changed and we find him in Rome executing commissions for one of the most spectacular of the men of the Renaissance, Caesar Borgia. As an individual Borgia was probably one of the most shameless of men and his crimes were the most flagrant and calculated. He was completely self-motivated.

It is possible that da Vinci first met Borgia in Milan after the triumphal entry of the French forces into that city, for he had remained there for some two months after Sforza had fled.

Caesar Borgia was a Cardinal at the age of seventeen but early found that this kind of a life was not to his liking and was released from his vows by the Pope.

He met Louis XII when he went to France bearing the approved divorce papers for the king. He returned to Italy with a new title, the Duke of Valentinois, a French wife and her dowry. He accompanied Louis in his triumphal entry into Milan.

Borgia, interested in gaining temporal power, instituted military campaigns against individual city kingdoms. He took the City of Faenza away from its lawful ruler, Astorre Manfredi, a youth of 18, and the City of Forli from its ruler, Caterina Sforza. Both had trusted his word and both ended up in the prison of San Angelo in Rome.

Leonardo was retained by Borgia as a military engineer in connection with the latter's seige of Piombino. It fell and now Borgia was preparing for another campaign to bring under his domination such areas as had not already acknowledged his sovereignty. He was, at this time, close to the pinnacle of his power.

The enemies of Caesar Borgia, realizing his plans, banded together under the pact of Mugione in September, 1502, and each pledged to his downfall. They let the prime time for annihilating him slip through their fingers, however, and ended up in negotiating a truce with him. Then, in a steady series of campaigns, he took their territory away from each of them in turn.

Borgia referred to da Vinci as "our most excellent and well-beloved servant, architect, and engineer-in-chief," and bid all his lieutenants, officials and subjects to extend to da Vinci every facility available to them to assist him in his work.

He further enjoined engineers in his domains to "confer with Leonardo da Vinci and follow his instructions under pain of incurring the writer's most severe displeasure." This was no idle threat to anyone who had had experience with Caesar Borgia.

(Continued on page 50)

New Literature

SAW BLADES—J. K. Smit & Sons, Inc., has announced the publication of a new brochure on diamond saw blades. The exact grade of blade to use, and the recommended depth of cut and speed of operation are given in the brochure for the modern, high-production sawing of such materials as green and cured concrete, brick, asphalt, tile, granite, glass block, marble, limestone, refactory brick and plastics. The brochure also introduces the J.K.S. Pacemaker series on diamond saw blades, which includes segmented blades in five grades with diameters of eight inches and larger, and continuous rim saw blades in two grades in diameters of three inches and larger.

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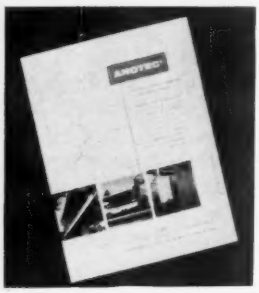
GRILLES—A new ANOTEC architectural anodized aluminum grilles specification manual has just been published. The manual provides complete



product specifications on the wide choice of standard geometric patterns, dimensions and colors on which this modern exterior/interior, decorative/structural material is now available. Outstanding industrial commercial and housing design use, in new construction and modernization, are shown in full color and black-and-white. The construction details of different applications—i.e., as a curtain wall, as a solar screen, as a walkway, etc.—are fully illustrated with technical drawings.

(Circle 16 in Readers' Service Dept.)

PLASTICS—A general description of many of the plastics produced by B.F. Goodrich Chemical Company is contained in a new booklet just released by the firm. Entitled "Quality Plastics for Quality Products," the 20-page booklet briefly describes many of the general purpose resins, latices and compounds produced by the firm. Present uses for these various products are discussed together with suggestions for new uses. Characteristics and processing of hi-temp Geon are discussed in the booklet. Introduced by BFG Chemical last May, this material is capable of withstanding temperatures of 60 degrees F. higher than other vinyls. Also contained in the booklet are sections devoted to Estane polyurethane materials, the first thermoplastic urethane material, and Polyblend 503H, a thermoplastic colloidal mixture of Geon vinyl resin and Hycar nitrile rubber.

(Circle 17 in Readers' Service Dept.)

PUMPS AND PIPING—An easy-to-follow 6-step guide to help designers of cooling tower installations plan their pump and piping requirements has been published by Bell & Gossett Co. "Six Step Manual for Sizing Cooling Tower Pumps and Piping," an 8-page booklet illustrated with diagrams and charts, explains a six-step process as a convenience to the designer. A page of charts illustrating the capacities in gallons per minute of B&G's series 1522 and 1531 pumps is included in the booklet to help designers select the most appropriate pump in light of whatever pressure head is involved. Also included are two tables, one showing total equivalent pipe footage for different pump pressure heads, the other showing the carrying capacities of various pipe sizes in gallons per minute.

(Circle 18 in Readers' Service Dept.)

INFILCO BROCHURE—Free, informative brochure on the new Infilco "Monodeck" digester tank floating cover has just been published by Infilco Inc., manufacturers of water, sewage, and waste treating equipment. Eighteen pages in length, it gives full information on Infilco's new trussless, single-plate and pontoon floating cover including detail design, basic principles of operation specifications and advantages.

(Circle 19 in Readers' Service Dept.)

SIGHT-GLASS—A new 6-page bulletin has been issued by the PresSure Products Company on safety glass, its structure and uses. The brochure describes briefly the steps involved in the manufacture of the glass as well as the standards observed, the methods of installation, the various uses, and also includes charts showing which types of glass are best for certain usages. The sight-glass has a minimum safety factor of ten and the variety of lens arrangements make it applicable in processes using acids. The brochure demonstrates a number of situations in which sight-glass is an important safety device.

(Circle 20 in Readers' Service Dept.)

ELEVATORS—A new 22-page booklet on industrial bucket elevators for the handling of bulk materials has been issued by Hewitt-Robins Incorporated. The booklet contains engineering data on various types of bucket elevators and recommends the grades of belting best suited for elevating materials of different weight, abrasiveness, temperature and other characteristics. One section deals with belt selection procedures based upon formulas developed over many years' experience in the design of elevators. Another section presents statistical tables on steel elevator buckets. There are also sections on trouble-shooting and belt splicing.

(Circle 21 in Readers' Service Dept.)

GLASTEEL—A new 20-page full-color bulletin detailing (1) the steps in manufacture, (2) physical and chemical properties and (3) end use of Glasteel

is now available from The Pfaudler Co., a division of Pfaudler Permutit Inc. The bulletin is comprehensive enough to be virtually a handbook on this versatile material of construction. Various sections are devoted to a brief description of Glasteel and its development, its general physical characteristics, and the nature of the physical and chemical bond that exists at the glass-steel interface. A technical data section follows which includes discussion of operating temperatures, thermal shock, heat transfer, testing facilities and resistance to acids and alkalies. The new bulletin contains five two-color charts plotting, respectively, resistance of Glasteel to various temperature - concentration combinations of nitric, acetic, sulphuric, hydrochloric and phosphoric acids.

(Circle 22 in Readers' Service Dept.)

LOCKS AND SHIELDS—Just issued by Mayo Tunnel and Mine Equipment their Bulletin #23 illustrates and describes air locks and tunnel shields. Demonstrating examples of work done in some of the nation's larger cities, the brochure shows how equipment is built specifically to the needs and conditions of the location. Among the products described are bulkhead air locks, cylindrical air locks, tunnel cars, and the Mayo pneumatic grouter and pea shooter.

(Circle 23 in Readers' Service Dept.)

NUCLEAR INSTRUMENTATION—A new 6-page brochure, available from Nuclear-Chicago Corporation, describes how to use nuclear gauges for rapid field determination of moisture and density in soils, aggregates, concrete, asphalt, etc. The nuclear moisture and density probes may be used on the surface of the material being tested or may be inserted into bore holes through access tubing to measure the moisture or density at selected depths to 200 feet below surface. Also shown are the nuclear probes in use in such areas as soil stability, air field runway sub-surface evaluation, borrow pit evaluation, sub-surface building foundation studies, testing of concrete, pavement failure studies, and compaction control of fills.

(Circle 24 in Readers' Service Dept.)

PLASTIC TUBING—Impolene can be used at operating temperatures up to 300° F. and working pressures to 450 psi, according to Imperial-Eastman Corp., manufacturer of this new stabilized polypropylene tubing in a new engineering report on the product. This tubing has 30 to 50 times the life of Nylon at elevated temperatures. It can be repeatedly steam sterilized. Impolene has longer usable life than other thermoplastic tubings because there is no gradual change in physical properties under adverse conditions, according to the brochure. Impolene is not affected by boiling sulfuric acid, resists concentrated hydrochloric acid and has nearly zero water absorption and extremely low absorption of mineral and vegetable oils.

(Circle 25 in Readers' Service Dept.)

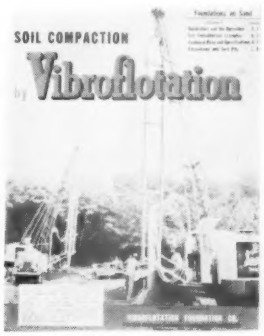
STEAM CONDENSATE LINES—The A. M. Byers Company has just published a new 32-page brochure entitled, "The Use of Wrought Iron Steam Condensate Lines." It explains how oxygen and carbon dioxide affect metal pipe; offers details on how to minimize corrosion in steam condensate lines; gives comparative service records in both commercial building and industrial plants; and points out where and how long wrought iron pipe has been in condensate service. Much of the special report is outlined for easy reference and quick, thorough comprehension. Important for those who wish to investigate is the list of places where the product has been in use in recent years, complete with addresses.

(Circle 26 in Readers' Service Dept.)

AIA BROCHURE—Availability of a newly-expanded AIA file brochure, described as the most comprehensive in the fiberglass reinforced plastic panel industry, was announced recently by Filon Plastics Corp. The 8-page brochure provides builders, contractors, architects and engineers with complete technical data and product information. It incorporates full testing details and conclusions about "Filoplate," a recently developed panel structurally guaranteed for the lifetime of any installation, and specifications for "Rotolite," the first cross-corrugated panel in roll form. It includes general specifications for the entire Filon line of corrugated, flat, glazing and decorative panels, heat and light transmission values, load carrying charts, illustrated construction details, and a "how to specify" section.

(Circle 27 in Readers' Service Dept.)

SOIL COMPACTION—Foundations on sand are described in the booklet, "Soil Compaction by Vibroflotation," recently published by the Vibroflotation Foundation Company. Contents of the booklet cover application and operation, soil consolidation examples, data on specifications, excavations and test pits. Detailed drawings show the Vibroflot machine in operation and a typical compaction pattern to produce required density. Also shown are examples of projects which have put Vibroflot to use, such as dams, shopping centers, hangars, and factories. A list of Vibroflot users is also given for reference.



(Circle 28 in Readers' Service Dept.)

These listings are informational only and are not an endorsement of the products, nor of the manufacturer's claims. To receive any of the new literature described in these columns, merely circle the item number in the Readers' Service Dept. and mail to AMERICAN ENGINEER.

TV Films Now Available For 1961 Engineers' Week

A series of seven 20-second TV spot films, narrated by Ben Grauer, will be one of the chief promotional items available for the 1961 National Engineers' Week, February 19-25.

Produced on 35mm film, the TV "spots" meet network standards for audio and video quality. The films are available in sets of seven 16mm prints ready for local TV station use, and are suitable for showing on public service time.

Each of the films calls attention to some phase of engineering activity. The subject matter includes highway transportation, bridge design, the exploration of space, missiles, electronics, structures, and steel making. The films emphasize the contributions of engineering to our way of life today, and the opportunities in engineering for young people in the years ahead.

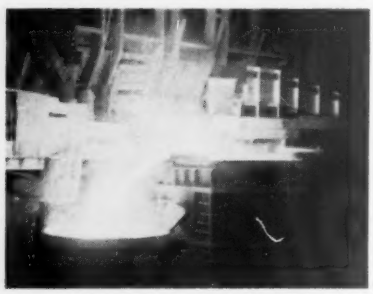
The voice of Ben Grauer has been familiar to radio listeners since 1930. His radio and TV work has covered nearly every type of sports event and news broadcast.

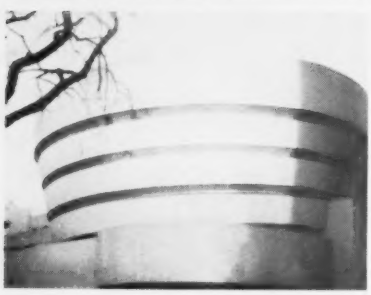
These TV films were designed to allow local chapters to reach a large segment of the general public with announcements calling attention to engineering and Engineers' Week. Estimates have been made which indicate that if each of NSPE's some 400 chapters were to place one set of the filmed announcements with a local station, the total nation-wide TV audience reached during the 1961 Engineers' Week would be in excess of 25 million.

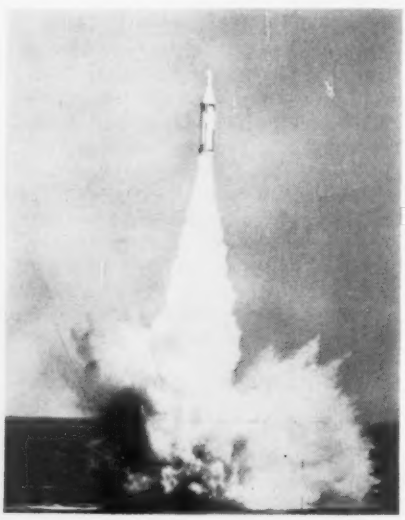
Prints of the films in 35mm will be made available to network programs sponsored by industrial firms employing large numbers of engineers. A set of the films in 16mm may be ordered from NSPE headquarters for $25. The films were produced by Alpert Productions of Washington, D. C. The producer and director, Sid Alpert, has made a number of full length films and TV spot announcements.

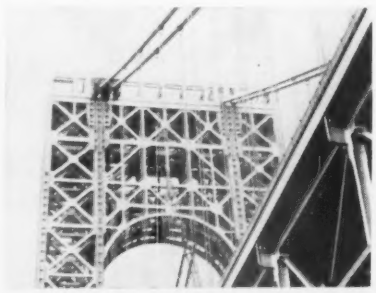
The TV slides available from the National Society may also be used during 20-second TV station breaks. The metal-mounted glass slides may be ordered from NSPE headquarters for $10 per set of seven.

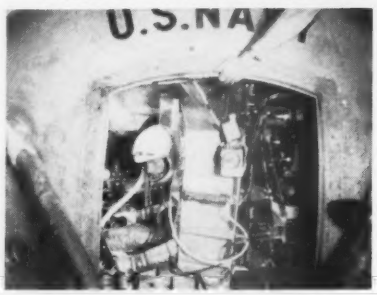
Additional questions concerning Engineers' Week should be sent to the National Society of Professional Engineers, 2029 K Street, N.W., Washington 6, D.C.

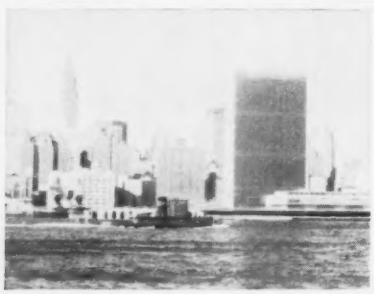




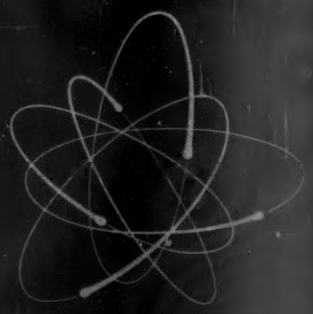








PROMOTIONAL AIDS FOR



NATIONAL ENGINEERS' WEEK

HERE are the basic promotional aids on which to build your Engineers' Week program. These items will give your program coverage in local newspapers, on radio and TV stations, and in civic and group displays. Use these promotional materials to emphasize the career opportunities in engineering.

1 ***TV Spot Films:*** A set of seven 20-second TV films dramatizing the theme of the 1961 National Engineers' Week. Produced to meet network standards, the films call attention to the career "doors" which are opened with an education in engineering and the physical sciences. Each film qualified for public service TV time during station breaks. A set of these seven films will reach your largest Engineers' Week audience. Price: Set of seven films, $25.

2 ***Set of Seven TV Slides:*** Obtain extensive TV coverage through the Week with these slides displaying poster-type art work and printed copy calling attention to engineering. May be used during all TV station breaks as public service announcements. Price: $10 per set of seven slides.

3 ***Tape Recorded Radio Announcements:*** A set of seven 20-second radio spot announcements, made by a network radio and TV announcer. Offers local stations a top-level recording for 20-second station breaks. Price: Set of seven recorded announcements, $3.50.

4 ***Lapel Buttons:*** A high-quality lapel badge with poster design. Each chapter or state society can set its own price for button sales. Prices: 100 to 500—15c each; 500 to 1,000—10c; 1,000 to 3,000—7c; 3,000 to 5,000—5c; and over 5,000—4c.

5 ***Posters:*** Colorful 9 x 11-inch pasteboard posters carrying the 1961 Engineers' Week design and theme. This is the basic promotional item for calling attention to the Week. Use on bulletin boards, in window displays, school exhibits, etc. Large size (18 x 22 inches) also available. Prices: 9 x 11, $4 per 100; 18 x 22, $5 per 100.

6 ***Paper Banners:*** Excellent for display use. Three feet long by 6 inches wide. Has poster design and words "National Engineers' Week" in color. Price: $4 per 100.

7 ***Bumper Stickers:*** Gummed paper stickers, 15 x 3¾-inch, carrying the words National Engineers' Week and a reproduction of the professional engineer's seal, in bright orange on a black background. Prices: 100 to 500—15c each; 500 to 1,000—10c; 1,000 to 3,000—7c; 3,000 to to 5,000—5c; and over 5,000—4c.

8 ***National Engineers' Week Seals:*** Use these brightly colored seals on all office mail from now through February 25. Poster design printed on 1½-inch gummed paper. Price: $3 per 1,000.

9 ***Newspaper mat story on the educational background needed for a career in engineering:*** A feature article stressing the importance of a well-ordered sequence of basic math courses throughout the four years of high school. Prepared on mat, with illustration, ready for immediate insertion in daily or weekly newspaper. Price: 75c each.

10 ***Newspaper mat story on the engineer in private practice:*** A feature article explaining what a consulting engineer does, what kind of background he needs, and how he must be registered as a professional engineer to sign plans and specifications. Prepared on mat, with illustration, ready for immediate insertion in daily or weekly newspaper. Price: 75c each.

11 ***Newspaper mat story on the engineer in industry:*** A feature article describing how engineers in industry utilize their professional knowledge and skill in research, development, and production. Prepared on mat, with illustration, ready for immediate insertion in daily or weekly newspaper. Price: 75c each.

12 ***Logotype:*** A metal cut of a poster design to insert in advertising, special sections of newspapers, industrial house organs, magazines, and other printed matter. All state society and chapter publications should have one. Price: $1 each.

13 ***"Engineering's Great Challenge . . . The 1960's:"*** A re-issue of the 15-minute tape recorded radio program distributed last year. Excellent for use on public service radio time. Price: $3 each.

USE THIS COUPON TO ORDER YOUR AIDS NOW!

1. ———TV spot films @ $25 per set.
2. ———TV slides: set of 7 slides @ $10 per set.
3. ———Recorded spot announcement @ $3.50 per set.
4. ———Lapel buttons: 100-500 @ 15c ea.; 500-1,000 @ 10c ea.; 1,000-3,000 @ 7c ea.; 3,000-5,000 @ 5c ea.; over 5,000 @ 4c ea.
5. ———Posters: regular size @ $4 per 100.
   ———Posters: large size @ $5 per 100.
6. ———Banners @ $4 per 100.
7. ———Bumper stickers: 100-500 @ 15c ea.; 500-1,000 @ 10c ea.; 1,000-3,000 @ 7c ea.; 3,000-5,000 @ 5c ea.; over 5,000 @ 4c ea.
8. ———Seals @ $3 per 1,000.
9. ———Newspaper mat stories on educational background for engineering @ 75c ea.
10. ———Newspaper mat stories on the engineer in private practice @ 75c ea.
11. ———Newspaper mat stories on the engineer in industry @ 75c ea.
12. ———Logotypes @ $1 ea.
13. ———Radio tapes: "Engineering's Great Challenge . . . The 1960's" @ $3 ea.

National Society of Professional Engineers
2029 K Street, N.W./Washington 6, D.C.

Sirs:
Please rush me items indicated. I enclose a check ☐ money order ☐ in the amount of $ _____
I understand remittance must accompany order.

NAME _____
(Please Print)
ADDRESS _____
CITY _____ STATE _____

Iowa Meeting to Consider Engineer's Role in the 60's

The Winter Professional Meeting of NSPE will be held in conjunction with the 72nd Annual Meeting of the Iowa Engineering Society at the Hotel Fort Des Moines, Des Moines, Iowa, February 8-11, 1961.

The theme of the meeting—The Role of Engineering in the 60's—will be highlighted by two special panel discussions featuring well-known representatives of industry and education. The first of these discussions will take place Thursday morning, February 9, and will concentrate on the reaction of educational and industrial leaders to the recent survey conducted under the sponsorship of the Professional Engineers Conference Board for Industry, "Engineering Professionalism in Industry." Representing the field of education will be George R. Town, P.E., dean of engineering at Iowa State University, and Arthur W. Melloh, P.E., dean of engineering at the University of Iowa. Industry will be represented by R. C. Wyth, president of the Viking Pump Company, and R. A. Engle, vice president (engineering) of the Fisher-Governor Company. The panel will be moderated by Waldo Wegner, P.E., national director of NSPE from Iowa.

The second panel discussion will occur Thursday afternoon at the formal opening of the NSPE Winter Professional Meeting. Conducted by Dr. Clark A. Dunn, P.E., this panel will discuss "The Role of the Scientist, Engineer, and Technician." This will set the scene for the very significant report to be given concerning the organization of the Institute for Certifying Engineering Technicians. Other featured speakers for this second panel will be Dr. Melvin R. Lohmann, P.E., dean of the College of Engineering, Oklahoma State University, and F. K. McCune, P.E., vice president—engineering services, General Electric Company. Dr. Lohmann will direct his remarks to "Education for the Team Effort;" Mr. McCune will develop his presentation around "Using the Team in Industry."

The host Iowa Engineering Society has created a well-balanced and interesting program in connection with their 72nd Annual Meeting, including various activities for the ladies. In addition to meetings of the various sections of the Iowa Society, and the two special panel presentations, the General Meeting Committee has a full program of social activities for those in attendance. The IES Meeting will formally close with a banquet Thursday evening, February 9. This function will be held jointly with the NSPE Board of Directors, and will feature an address—"The Strength of a Nation"—by Curtis L. Wilson, P.E., dean of Missouri School of Mines and Metallurgy, University of Missouri.

The full details of the program follow.

Program for IES-NSPE Meeting

Hotel Fort Des Moines—Des Moines, Iowa
February 8-11, 1961

WEDNESDAY, FEBRUARY 8

9:00 a.m.—Registration for IES Annual Meeting

9:00 a.m.—NSPE Executive Committee Meeting

Morning—IES Section Meetings

Noon—"Get-Acquainted" Luncheon
Quo Vadis—Paul H. Robbins, P.E., Executive Director, NSPE

2:15 p.m.—General Session
The Iowa Registration Law—Its Impact on You
George C. Ahrens, P.E.
Chairman, IES Legislative Committee
IES Business Meeting

6:00 p.m.—Hospitality Hour

7:00 p.m.—Buffet Supper

THURSDAY, FEBRUARY 9

9:00 a.m.—Registration continues

10:00 a.m.—Special Panel Discussion

Noon—General Luncheon
Speaker: Harold A. Mosher, P.E., Associate Director of Engineering, Eastman Kodak Company (Past President—NSPE)

2:00 p.m.—Formal Opening of NSPE Winter Professional Meeting
Roll Call of Members of the Board
The Society in 1961
Nooh E. Hull, P.E.
President, NSPE

ENGINEERING PROFESSIONALISM IN EDUCATION AND INDUSTRY

Panel Discussion, Thursday, February 9, 10:00 a.m.

Moderator: Waldo Wegner, P.E., NSPE National Director

Panel Members: R. C. Wyth, president, Viking Pump Co., Cedar Falls, Iowa

R. A. Engle, vice president (engineering) Fisher-Governor Co., Marshalltown, Iowa

George R. Town, P.E., dean of engineering, Iowa State University, Ames, Iowa

Arthur W. Melloh, P.E., dean of engineering, State University of Iowa, Iowa City, Iowa

THE ROLE OF THE SCIENTIST, ENGINEER, AND TECHNICIAN
Dr. Clark A. Dunn, P. E., Chairman, Committee on the Merging Role of Science and Engineering

Dr. Melvin R. Lohmann, P.E. ..... **Education for the Team Effort**
Dean, College of Engineering
Oklahoma State University

F. K. McCune, P.E. ..... **Using the Team in Industry**
Vice President—Engineering Services
General Electric Company

PROFESSIONAL RELATIONS GROUP
Vice President Stuffebean, P.E., presiding
Organization of the Institute for Certifying Engineering Technicians
A. C. Friel, P.E., Chairman, Committee on Engineering Technicians
5:30 p.m.—Hospitality Hour
7:00 p.m.—IES Banquet
Address: The Strength of a Nation
Curtis L. Wilson, P.E., Dean, School of Mines and Metallurgy, University of Missouri

FRIDAY, FEBRUARY 10
8:00 a.m.—Registration Continues
8:00 a.m.—PROFESSIONAL RELATIONS GROUP continues
Developments on Engineering-Architect Relations
A. C. Miller, P.E., Chairman, Interprofessional Relations Committee
Board of Ethical Review—Report of Cases
Recruiting of Engineers
Conflict of Interests
Practice in Other than Major Field
Competitive Materials—Reduction of Standards
Competitive Bidding
Gifts
P. G. Ellis, P.E., Chairman, Board of Ethical Review
Review of Policies and Rules of Professional Conduct on Competitive Bidding
H. W. Honefenger, P.E., Chairman, Ethical Practices Committee

PUBLIC RELATIONS GROUP
Vice President Rouse, P.E., presiding
1961 Engineers' Week Plans
Preview of Slides and TV Spot Announcements
W. C. Stadden, P.E., Chairman, Engineers' Week Committee
Review of Script for Proposed Film on Engineering Professionalism
J. L. Pratt, P.E., Chairman, Public Relations Committee
Legislative Handbook
W. J. Kreske, P.E., Chairman, Legislative Committee
Organization of Engineering and Scientific Activities in the Federal Government
H. A. Mosher, P.E., Chairman, Committee on Federal Engineering and Scientific Activities
10:00 a.m.—Recess for Regional Meetings and Regional Luncheons
2:00 p.m.—PROFESSIONAL DEVELOPMENT GROUP
Vice President Elliott, P.E., presiding
Proposed Survey of Current Presentation of Professionalism in Engineering Colleges
W. H. Parks, P.E., Chairman, Education Committee
The Expanding Student Chapter Program
Increasing Effectiveness of the Student Contact Program
J. Neils Thompson, P.E., Chairman, Student Professional Development Committee
New Uses for the Engineers' Record Book
W. W. Wegner, P.E., Chairman, Young Engineers Committee

PROFESSIONAL EMPLOYMENT GROUP
Vice President Backlund, P.E., presiding
Progress Report on Preparation of New Publication on Engineer-Management Relations
Unionization Developments
R. G. Hoft, P.E., Chairman, Engineers in Industry Committee
Meeting with Department of Labor on Application of Davis-Bacon Act to Survey Crews
Coordination Efforts with Other Engineering Groups
Self-Employed Retirement Legislation
L. M. Van Doren, P.E., Chairman, Functional Section for Consulting Engineers in Private Practice
Comparison of Engineers' Salaries in Industry with the Federal Government
Release of Merit System Survey Report
Recommendations on Status of Engineers in Uniformed Services
Promoting Government Functional Section Activities at the State and Chapter Level
W. E. Gilbertson, P.E., Chairman, Functional Section for Engineers in Government Practice
Evening ..... Free

SATURDAY, FEBRUARY 11
9:00 a.m.—Professional Meeting Continues
Selection of Meeting Sites for 1963
ORGANIZATIONAL FUNCTIONS GROUP—Vice President Mann, P.E., presiding
Editorial and Advertising Plans for 1961
G. R. Henninger, P.E., Chairman, American Engineering Committee
Increasing the Effectiveness of Functional Sections
C. R. Hanes, P.E., Chairman, Functional Section Services Committee
Implementing the Training for Membership Program
H. F. Pierce, P.E., Chairman, Membership Committee

POLICY OPERATIONS GROUP
Considerations on Size and Representation—NSPE Board of Directors
L. E. Easley, P.E., Chairman, Organization and Functions Committee
Report of Constitution and Bylaws Committee
G. S. Rawlins, P.E., Chairman, Constitution and Bylaws Committee
Resolutions
L. W. Veigel, P.E., Chairman, Resolutions Committee

REPORT OF EXECUTIVE COMMITTEE
NEW BUSINESS
ADJOURNMENT

Iowa State Capitol

The State Capital Building in Des Moines is unusual among other Capitals for its architecture. Meeting for the first time in Iowa, the National Society will hold its Winter Professional Meeting in Des Moines concurrently with the 72nd annual meeting of the Iowa Engineering Society.

Washington Chapter

A monument commemorating the work of pioneer engineers, and specifically Marvin Chase, the first state hydraulic engineer for the state of Washington, was dedicated recently by the Washington Chapter of the Washington SPE. Shown (l. to r.) at the dedication are Paul H. Symbol, president of Washington SPE; Ira R. Kline, past chapter president; John Chase and C. G. Chase, sons of Marvin Chase; John McDonald, president of Chelan County Historical Society; Mrs. George Fasken, first president of Chelan County Historical Society; and Ivan Compton, district commissioner of Chelan County public utilities.

Engineering Deans Will Get NSPE Publication

College of engineering deans throughout the country will be given the opportunity to receive a complimentary copy of the NSPE publication "Criteria for Professional Employment of Engineers" for the fourth year.

Copies are available for each graduating senior. Past experience has shown that the book is an aid to seniors in their consideration of engineering employment opportunities.

This year copies of "Q & A About Registration for the Engineer in Industry" are also available.

Functional Section Committee Convenes

The Engineers-in-Industry Functional Section State Committee met in Newark, N.J., recently and reviewed the proposed bylaws prepared by the Bylaws Subcommittee. A number of modifications were agreed upon by all present.

The next steps to be taken include preparation of a slate by the nominating subcommittee, calling a general organization meeting, and acceptance of the bylaws.

Former AE Staff Writer Publishes Book on Dulles

David Heller, whose by-line will be familiar to long time readers of the AMERICAN ENGINEER as a former staff writer of this magazine, has teamed up with his wife, Deane, to write one of the major books of the 1960-61 season.

The Hellers' book, *John Foster Dulles, Soldier For Peace,* was published by Holt, Rinehart and Winston, Inc. Among the many persons who cooperated with the Hellers in the preparation of the book was Mrs. John Foster Dulles, widow of the late Secretary of State.

D. C. Society Award

Major General A. M. Minton (r.), the Air Force's director of civil engineering, received the annual award for "outstanding contributions to the engineering profession," from Mr. Claude A. Copenhaver, a director of the District of Columbia Society of Professional Engineers, at the Pentagon recently. Mr. Copenhaver is employed in the C.E. Directorate. This will mark the first time the District of Columbia Society has bestowed this honor on a military man.

Dean Weil Receives Honorary Degree

Dean Joseph Weil, of the University of Florida's College of Engineering, was awarded an honorary Doctor of Science degree by Jacksonville University recently by University President Franklyn A. Johnson.

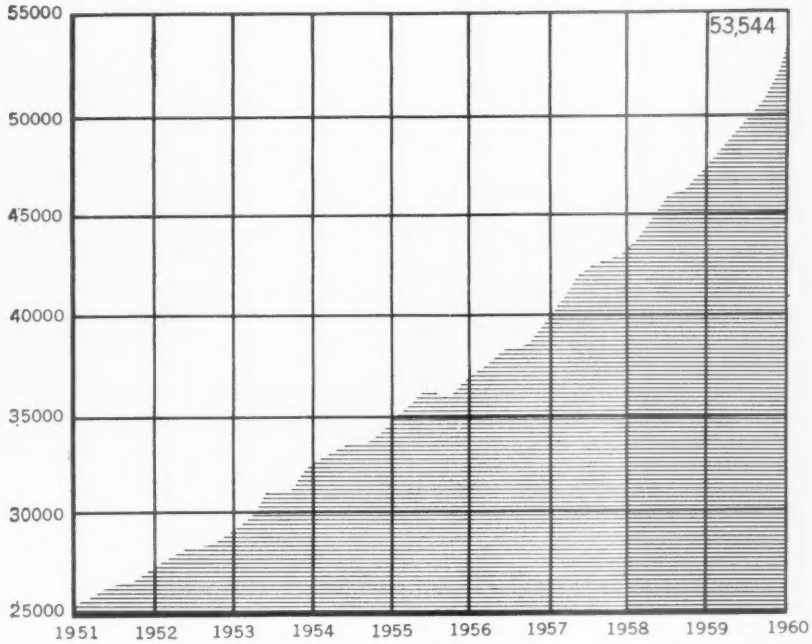
Dean Weil

Only six such degrees have been conferred since Jacksonville University became a four-year college in 1956. Three university presidents, one Nobel Prize winner and a founder of the university were previous recipients.

Dean Weil is director of the Engineering and Industrial Experiment Station at the University of Florida, a member of NSPE, Florida Blue Key, Phi Kappa Phi, a Fellow of the Institute of Radio Engineers, and a life member, American Institute of Electrical Engineers.

He received the Presidential Medal of the Florida Engineering Society in 1945, the Naval Ordnance Development Award, and the Distinguished Service Certificate from the National Council of State Boards of Engineering Examiners.

NSPE Membership Chart



CCNY Names Building After D. B. Steinman

City College of New York will name its new $9,000,000 School of Technology building in honor of the late David Barnard Steinman, who was an alumnus of the class of 1906.

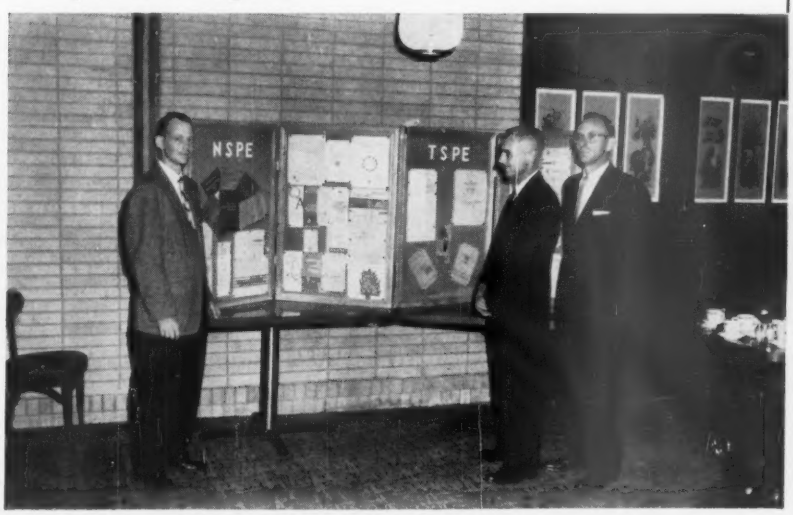
The new technology building, which will be known as David B. Steinman Hall, is a six-story building, modern in design, made of reinforced concrete with a glass-brick exterior and marble sheathing.

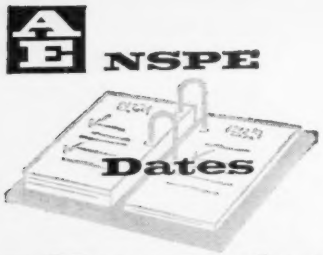
A founder and the first president of NSPE, Mr. Steinman was also one of the world's most renowned bridge designers and engineers.

Operation Pegboard

The Nueces Chapter of TSPE was the first to display the new 4-panel literature pegboards prepared by the TSPE Public Relations Committee for chapter use. The boards are part of the TSPE plan for a better informed membership by bringing the literature available through NSPE and TSPE to the attention of individual members and prospective members.

Presenting the display to the Nueces Chapter at a recent meeting are: (l. to r.) Sig Sorenson, chairman, Nueces Chapter Activities Committee; Cecil Dudley, president of the Nueces Chapter; Jim Flanagan, chairman, Nueces Public Relations Committee.





to Remember

Louisiana Engineering Society—Annual Meeting, January 12-13, Capitol House, Baton Rouge, Louisiana.

Mississippi Society— Annual Meeting, January 19-20, King Edwards Hotel, Jackson, Mississippi.

Texas Society— Annual Meeting, January 19-21, Windsor Hotel, Abilene, Texas.

Alaska Society of Professional Engineers—Annual Meeting, January 13, Anchorage, Alaska.

Idaho Society—Annual Meeting, February 3-4, Boise Hotel, Boise, Idaho.

Iowa Society—Annual Meeting, February 8-9, Hotel Fort Des Moines, Des Moines, Iowa.

National Society of Professional Engineers—Winter Meeting, February 9-11, 1961, Hotel Ft. Des Moines, Des Moines, Iowa.

Minnesota Society—Annual Meeting, February 22-24, Pick-Nicollet Hotel, Minneapolis, Minnesota.

New Mexico Society — Annual Meeting, February 24-25, Santa Fe, New Mexico.

Kansas Engineering Society—Annual Meeting, February 24-25, Parrish Hotel, Great Bend, Kansas.

Tennessee Society—Annual Meeting, March 3-4, Andrew Johnson Hotel, Knoxville, Tennessee.

Ohio Society—Annual Meeting, March 16-18, Dayton-Biltmore Hotel, Dayton, Ohio.

National Society of Professional Engineers—Annual Meeting, July 4-7, 1961, Olympic Hotel, Seattle, Washington.

Birmingham Chapter Told of Extension Center

Important and vitally needed engineering courses projected for the Birmingham Extension Center of the University of Alabama were revealed to be several steps closer to realization recently at the monthly meeting of the Birmingham Chapter, Alabama SPE.

Dr. Richard Eastwood, executive director of the Extension Center, in a talk at the meeting, announced several top ranking professors had been added to the faculty of the Center to supply the necessary instruction needs, that a contingent pledge of $200,000 from a foundation had been set aside to be available when local funds had reached $650,000. With $850,000 the Center can add classroom and other facilities. The Center's main building is constructed so that four more stories can be added.

Tentative plans are to begin a special, carefully organized solicitation campaign the latter part of November, and the large engineering contingent of the area will be enlisted to further the effort. Industrial and commercial interests also are expected to assist, so that the whole undertaking will be in reality a community project. With the fund accomplished, and the facilities once installed, the University feels that it can care for the running expenses.

Dr. Eastwood said that to begin with the school would afford one undergraduate degree and one graduate master's.

Ivan C. Crawford

Ivan Charles Crawford, 74, a state representative, former director of the Colorado Water Conservation Board and former engineering dean of three U.S. universities, died recently in Boulder, Colorado. A member of NSPE since 1952, he held a degree in civil engineering from the University of Colorado, and had served as engineering dean at the Universities of Idaho, Kansas and Michigan.

Topeka Chapter KES Supports Science Fair

The Topeka Chapter of the Kansas Engineering Society has, by action of its board of directors and the entire chapter membership, voted to give active support to the Topeka Regional Science Fair.

The Topeka Regional Science Fair is now incorporated as a nonprofit organization to promote the fair which is a display of the projects prepared by students in the Topeka area and to encourage their study of science and its related fields.

Ted Clark, consulting engineer, of the Topeka Chapter and the Topeka Chapter's delegate to the board of trustees of the Topeka Regional Science Fair, Inc., has been elected president of the board. Bruce M. Johnson of the Beck-Baer Company, also a member of the Topeka Chapter, is also a member of the board of trustees.

The board of trustees consists of representatives of many civic and professional organizations, industry, and others interested in the encouragement of science study at the student level.

The Fair will be held April 8 and 9, 1961, for the current school year.

Toledo Chapter

Members of the Toledo SPE recently enjoyed a cruise and inspection trip of the Toledo Harbor Installations. Included in the trip was a buffet supper on board. Each visitor received a detailed map of the Harbor Installations prepared by the Port Authority.

By Mrs. Clark A. Dunn, Chairman, Ladies Auxiliary Advisory Committee.

The Ladies Auxiliary Advisory Committee takes this opportunity to wish the National Society of Professional Engineers as well as every auxiliary a most successful new year. We also hope that every member of these organizations will achieve personal satisfaction and happiness in 1961.

The annual meeting of the State Council of Auxiliaries of Pennsylvania was held last summer. Reports were given by all chapters. All seemed eager to assist their sponsoring chapter. Mrs. Hugh M. Nelson was elected state chairman for another year, so the organization will be in good hands for another year.

Another state auxiliary is the one organized in South Dakota a few years ago. Since there is but one chapter of the SDSPE, the ladies organized on a state wide basis. According to Mrs. Julian Staven, president, the auxiliary meets four times a year concurrently with the men's meeting. The most recent meeting was held in Huron in November. It was well attended and much interest was shown.

The Fresno, California Wives of Professional Engineers group is one of the most active in the nation. Their enthusiasm is contagious and is largely due to the leadership of their president, Mrs. Calvin G. Ellis. Their cooperation with the men's chapter is unusually close. They stand ready to assist them whenever they are needed. An outstanding early fall meeting was a get-acquainted brunch and "Diamond Jubilee" fashion show of heirloom fashions of by-gone days. Another big event was a masquerade ball at which the ladies were host to their husbands in a gayly decorated bayou setting. The newspaper publicity received by this auxiliary was unusually good.

The Western Chapter Auxiliary of Kansas City, Mo., is in full swing with 123 members. They have had some wonderful program meetings: a lecture on "What Engineers do in Research," by Mr. Stephen D. Hadley, and a talk by Dr. Hans Schweiger, director of the Kansas City Philharmonic. This auxiliary feels very fortunate to have as their program chairman, Mrs. Garvin Dyer, past chairman of the Ladies Auxiliary Advisory Committee.

In New Jersey, the Essex County Auxiliary now has a permanent meeting place at the Maplewood Civic Center. Here they have social get-togethers after each meeting. They are considering initiating a scholarship fund in the coming year.

NSPE News Briefs:

• The Piedmont Chapter of the South Carolina SPE recently met with the Ladies' Auxiliary in Greenville, S.C. Highlight of the evening was the presentation of certificates of outstanding service to past chapter presidents Milton Lite and Ben Leppard, both of Greenville.

• Winfield J. Johnson recently assumed the responsibilities of executive secretary of the Minnesota SPE at the headquarters in St. Paul. He replaces Robert J. Newbury.

• The Joliet Chapter of the Illinois SPE recently honored the newly registered professional engineers and engineers-in-training at their annual recognition dinner. The dinner was also designated as Ladies' Night with regular members and wives invited. Entertainment for the occasion was provided by architect Ben Borkin, who presented colored slides of architectural beauty in England, Scotland, and Wales.

• Past NSPE President Sid Stolte recently addressed a group of students at the University of Minnesota on the topic, "Professional Concepts for Students." In connection with his talk Stolte also showed the NSPE film, "Building for Professional Growth."

• Nassau County Chapter of the NYSSPE recently awarded a $500 scholarship to Baldwin High School student Robert Bebom for his winning paper "Municipal Fall-Out Shelter," an entry in the annual scholarship contest. Bebom's entry was submitted as an engineering design which would improve his community.

• James C. Stewart, Jr., formerly the regional manager of the North Texas Area of the Texas Manufacturers Association, assumed duties January 1, 1961, as the executive secretary of the Texas SPE in Austin.

• At a joint dinner meeting of the Western Chapter, Missouri SPE, and the M.I.T. Club, Dr. Rolf Eliassen, professor of sanitary engineering at M.I.T., spoke on "The River Pollution Problem and Sanitary Engineering." In view of the recent acceptance by Missouri voters of a $75 million bond proposition for alleviation of the pollution problem of the Missouri River, the talk was particularly timely.

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Thoughts on Professionalism...

By PAUL H. ROBBINS, P.E.
NSPE Executive Director

Whose Job To Teach Professionalism

IN any discussion on professionalism, there is the inevitable comment that more should be done to inculcate professional concepts among engineering students. All agree that resolution of many engineering professional problems would be considerably facilitated if students both understood the problems involved and became sufficiently concerned to expend some of their time as professional people toward their solution.

AT a recent informal discussion with several deans, the comment was made that this is a frequent element of concern among deans of engineering. It is a rare dean who is not conscious of the need for professional concepts among his students, who is not himself registered, and who is not continuously encouraging his faculty to discuss professional problems with the students. The same can be said for most heads of departments, but at the teaching level there tends to be feeling that it is a professor's responsibility to teach his particular technical courses and someone else should be responsible for discussing the professional problems with students.

NO one will belittle the role example plays in the attitude and orientation of a student. Can, for example, a teacher effectively promote professional consciousness if he himself has not taken the necessary steps to become registered? With the increasing emphasis on the part of all users of engineering services, on the necessity for legal qualification as a professional engineer, is a teacher meeting his full responsibility to his students by an example of failing to meet the requirements of his state law for the practice of his profession? It is interesting to note that where a high percentage of the faculty is registered usually a high percentage of the students will take the engineer-in-training examination as the first step toward professional qualification.

IT is disturbing to have seniors on occassion express to a professional engineer involved in discussions of professional matters the comment, "Why don't they tell about this in college?" It is perhaps this dilemma as much as any other single item which is causing the growth of NSPE student chapters on a number of engineering college campuses. With the assistance and guidance of professionally minded faculty and local chapters of professional societies, students are meeting regularly, many times under the organizational structure of a state society student chapter, to discuss problems they will meet in the business world as professional people. Members of local chapters of NSPE in the vicinity of engineering colleges have a real opportunity to assist faculty in bringing to the student their experience and the multitude of considerations on professional matters which are available through the literature and studies of professional societies.

AS so many professional problems cannot be solved by an attitude of "let someone else do it," no member of the profession, if he has the opportunity, can shirk his responsibility of giving to future generations of engineers the insight into the professional problems which will need to be solved if engineering is to adequately serve the nation in the years to come.—**End.**

(Continued from page 39)

It was quite in keeping with his character that he would wish to know about everything that was being said of him. He commissioned Leonardo to devise and build a series of listening pipes in his castle which the latter concealed in the thick walls of the structure.

Da Vinci used the principle of the so-called Ears of Dionysius, which allowed the ruler to hear from one chamber all that was said in the others connected to it.

Why da Vinci left Borgia we do not know. He may have terminated his contract, he may have been dismissed, but it is more than likely that, because he lived for things of the mind, as his writings show, he found it impossible to stand for the things that Caesar Borgia represented.

The idea of permitting unnecessary suffering and the taking of life was abhorrent to da Vinci. This was a man accustomed to buying captive birds in the market place and then freeing them. Caesar Borgia, who thought nothing of shedding men's blood like water, could not have held an attraction for him too long. This is probably the reason that he returned to Florence.

Borgia, living by the sword, perished by it in an obscure skirmish —slain for his glittering suit of armour.

Pisa was still engaged in a life and death struggle with the city of Florence. Since 1494, when Pisa had declared her independence from foreign rule, Florence had been engaged in trying to reestablish her rule by reducing the former's defenses or to effect its surrender through famine. Neither had worked to date.

The signora asked da Vinci's advice.

A dispatch of July 24, 1503, concerning plans for the campaign read: "Alessandro delgi Albizzi, together with Leonardo da Vinci and certain others have been there [the Florentine encampment] and have studied the plan with the commander-in-chief, and after much discussion and considerable difference of opinion have come to the conclusion that the work would be very suitable, whether it ac-

tually succeeded in turning the course of the Arno or only went so far as the construction of a canal which would, at any rate, prevent the hills from being menaced by the enemy."

A dam was to be built across the river to stop its course and two trenches, seven braccia deep and one 20 and the other 30 braccia wide, were to be dug to lead it into the marshes. Thence it would pass to the sea.

The commission originally estimated that it would require up to thirty or forty thousand days' work to effect completion of the project. They also stated that if a labor force of two thousand men were to be employed the whole could be completed in fifteen days.

The work, in spite of adverse criticism, was undertaken but when the rainy season came the laborers deserted. The actual costs were running above the original estimates and after two months effort the end was not in sight. Finally, after all the time and effort had been expended, the project was abandoned.

Leonardo's ideas were expressed in his notebooks. He wrote, ". . . the river which is to be turned from one place to another ought to be coaxed and not treated roughly or with violence, and in order to do so it is necessary to make a sort of floodgate in the river and then lower it down to another in front of it, and in like manner to construct a third, and a fourth, and a fifth, so that the river may empty itself into the new channel given it."

His ideas were finally realized some two hundred years later., i.e., alterations in the channel of the Arno were effected through a plan for the construction of a navigable canal prepared by a disciple of Galileo.

Da Vinci's detailed plans for accomplishing his purposes were unusually practical. He wrote, "Let sluices be made in the Val di Chiana at Arrezzo so that when there is a shortage of water in the summer in the Arno the canal may not remain dry; and make this canal 20 braccia wide at the bottom and 30 at the top, and two braccia deep, or four so that two of these

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may go to serve the mills and the meadows which will benefit the country; so that Prato, Pistoia and Pisa, together with Florence, will gain two hundred thousand ducats a year and will supply labor and money for this useful work, and the Lucchesi the same because the lake of Sesto will be made navigable.

I should make it pass by way of Prato and Pistoia and cut through Serraville and make an opening into the lake; for there will be no need of locks or supports, which are not lasting and so will always be giving trouble in working at them and maintaining them."

Louis XII had meanwhile made his triumphal entry into Milan on May 24, 1507. Leonardo had his vineyards just outside of Porta Vercellina. He wanted to return to his property. Everything was the same except that the French—not the Sforzas—were in power. There was, it is true, the vast reserve of the French power behind the French administrators and this fact produced a sense of stability in Milan that had never been known in the days of Ludovic Sforza.

Da Vinci was welcomed back by the French. The king had written to the Signoria in Florence urging the speedy return of da Vinci and referred to him as "his painter and engineer in ordinary."

Shortly after his return he was engaged, by request of the authorities, in devising a remedy for the diminution in the amount of water from the Adda available for irrigation purposes since the construction of the canal. His proposal was to create a network of small canals.

Then, too, he continued his work on the Martensana. The original work in attempting to make this river navigable had been instituted in the time of Ludovic Sforza when Leonardo, in association with a group of engineers, had been acting under authority of the Duke and the civic authorities.

In this instance he had devised a plan whereby the river could be made navigable. Now he was back at his old work.

To him, as a result of his various schemes for irrigation, is generally given the credit for making

possible the renowned fertility of the Lombardy plains.

Scattered throughout his notebooks are innumerable studies of waves and currents. They give us a clue to his industrious mind in making studies pertaining to the laws and conditions of water movement.

The mind of the artist is also readily apparent in his notebook studies on this subject of water movement. He delighted in the rhythm and harmony created by the flow and ebb of the waves, their creation of undulating movements. These forms were easily translatable into the hair forms we find in his art masterpieces.

Leonardo's association with the French kings came at a time in his life when, to all intents and purposes, he had passed the zenith of his powers.

Francis the First gave him a chateau near Amboise as a place of residence in his declining years and as a mark of the king's high esteem and favor. This was the Chateau of Cloux and it was here that the Cardinal Luis of Aragon, a half-brother of Francis, visited him sometime during the years, 1516 or 1517. His secretary left us his written impression of Leonardo: "On the tenth of October, 1517, Monsignor and the rest of us went to see, in the outlying parts of Amboise, Messr Lunardo Vinci, the Florentine, an old man of more than seventy years, the most excellent painter of our time, who showed his Excellency three pictures, one of a certain Florentine lady done from life at the instance of the late Magnificent, Giuliano de' Medici, another of St. John the Baptist as a youth, and one of the Madonna and Child in the lap of S. Anne, all most perfect and from whom, since he was then subject to a certain paralysis of the right hand, one could not expect any more good work.

"He had given good instructions to a Milanese pupil who works very well. And, although the aforesaid Messr Lunardo cannot color with the same sweetness as he used to, he is still able to make drawings and teach others.

"This gentleman had written of anatomy with such detail, showing by illustrations the limbs, mus-

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cles, nerves, veins, ligaments, intestines and whatever else there is to discuss in the bodies of men and women, in a way that has never yet been done by anyone else. All this we have seen with our own eyes; and he has said that he dissected more than 30 bodies, both of men and women, of all ages."

The writer concluded, "He has also written of the nature of water, of divers machines and other matters, which he has set down in an infinite number of volumes all in the vulgar tongue which, if they should be published, will be profitable and very enjoyable."

It should be pointed out that Leonardo was not 70 for he was only 67 at the time of his death some time after this visit.

While there is no concrete evidence to support the supposition it is entirely conceivable that, when the king ordered a new wing to be added to the Chateau du Blois between the years, 1516 and 1519, the spiral staircase—an outstanding feature of the structure—was created by da Vinci.

He had made a number of close studies into the structure of sea shells and investigated their formation. His notes contain a considerable amount of data on the result of his investigations on this subject. The staircase in the new wing of the chateau has the form of a left hand spiral closely following the pattern of the Voluta Vespertilo, a sea shell found only on the northwest coast of Italy.

Leonardo, with the unique combination of his place of residence at the time, his artistic ability and his knowledge of form and structure, could well have been the person consulted by the king in the creation of this beautiful feature.

Francis paid tribute to Leonardo, as reported by Benvenuto Cellini, saying, ". . . he did not believe that there had ever been another man born into the world who had known as much as Leonardo da Vinci," and, ". . . this not only in matters concerning sculpture, painting and architecture, but because he was a great philosopher."

Much that we know about da Vinci is derived from his notebooks which, at one and the same time, are a curious blend of philosophi-

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cal musings, flights of creative imagination and household accounts—meticulous, daily balanced accounts—which contrast sharply with reflections, put to paper by da Vinci such as, "Call not that riches which may be lost; virtue is our true wealth, and the true reward of its possessor."

It is almost impossible for us, today, to conceive of one being who qualifies as an artistic genius, architect, engineer, scientist, musician and according to some reports, athlete. These things all apply to the many faceted da Vinci.

He was centuries ahead of his time mechanically. His theories of hydraulics, gears and roller bearings are basic. With modifications his principles of hoists, cranes, pulleys, meters and steam pressure for industrial applications are being used today. His mechanical apparatuses are in everyday use in the twentieth century industry.

This is the man who could create such masterpieces as "The Last Supper" which, although in a state of ruin, is still honored. Art connoisseurs can still pen argumentative pieces about his paintings and yet find common agreement in the permanence of the position of such works as his "Madonna and Child" or his "Mona Lisa."

Time has erased the last vestiges of the grave in which he was placed in 1519, but it can never erase the realization of his greatness in adding to the world's riches. He could well have ended his days according to his own precept, "As a well spent day brings happy sleep, so life well used brings happy death."—**End**

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(Continued from Page 38)

continuity, sequence, integration and evaluation; carefully defined course objectives; and the establishment of conditions for learning that will lead the student to continue the process after the teacher is no longer present. He listed these conditions as nine in number: proper student motivation, stimulation of the student to try new ways of reacting, guidance of new reaction behavior, appropriate materials with which to work, time to practice new behavior, installing a sense of satisfaction from the new behavior, opportunity for extended sequential practice, establishment of high standards of performance by the student himself, and finally, development of an ability by the student to judge his own performances.

Wesley A. Wiksell, professor of speech at Louisiana State University, suggested a number of ways to improve the presentation of classroom material. These include the establishment of a special course for teachers by the speech department, the use of a checklist to gauge student reaction to the teacher's presentation, and work with a tape recorder to improve diction and pronunciation. He went through the 23-point checklist in detail, showing how the teacher could correct each criticism and add to his effectiveness.

Paul L. Dressel, director of institutional research at Michigan State University, discussed the role of evaluation in improving teaching. He noted that evaluation was often used solely to determine promotion order rather than to improve learning and demonstrated an evaluation system designed to improve instruction and—to some extent at least—independent of promotion procedures. He said that profound improvement can come from such evaluation techniques as measuring student response to instruction, allowing the instructor to monitor tape recordings of his classes, putting an experienced teacher in the classroom with a young instructor, and through subjective opinion and research on the characteristics of successful teachers.

The need for lesson, course, and curriculum planning was likened to the need for blueprints to engineer an industrial product. H. T. Morse, dean of the General College, University of Minnesota, stressed that "intuitive planning and operation" was insufficient to present today's engineering curriculum.

Other general sessions included a discussion of tests and examinations used for promoting learning led by Robert L. Ebel, vice president, Educational Testing Service, and one on creativity by Eugene K. Von Fange, advanced development engineer, General Electric Company.

In addition to day and evening sessions, informal groups met for consideration of such matters as classroom creativity and climate, restoration of good teaching along with research as a proper basis for promotion, the threat of depersonalization as enrollments increase, the shift from emphasis on purely mechanical skills to intellectual skills, and the need to turn out not just an engineer, but a whole man who would grow in service and accomplishment throughout his lifetime.—**End**

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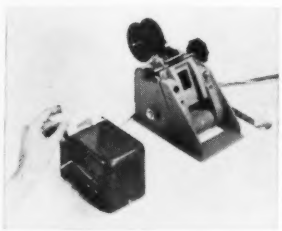

A new unit, designed to speed the precision mounting of microfilm on aperture cards has been developed by Dataflow, Inc. Designed for use in conjunction with a mounter, the new device instantly and clearly removes the glassine protective covering from the adhesive edge of the aperture, eliminating bending or crimping of card stock, and avoiding damage to the adhesive.

GAGE TRANSDUCER — Item 31

Statham Instruments, Inc., has developed the smallest known strain gage transducer, the Statham Model P318, a micro-miniature, flush-diaphragm absolute pressure transducer with high frequency response. Ranges for the P318 are 0-10 psi, available in absolute, gage or differential. Excitation is 15 volts. Output is 5 millivolts. Ambient temperature limits are —65 to +150 degrees F.

ADJUSTABLE TRIPOD — Item 32

A practical "skyhook" is now available for non-crane areas. Called "Magic-Pole Tripod," it has three telescoping legs that adjust separately up and down, and may be positioned in any direction. Most models of the unit may be carried to inaccessible locations and assembled by one man. Outstanding features include a free swivelling eyebolt that hangs away from the machined alloy head, avoiding twisting. Each leg is equipped with a removable steel base plate that adjusts angles, and spring-loaded safety bolts are provided that lock, freeing hands while making leg adjustments. Tripods are available in six different models.

REFLECTOR — Item 33

Grote Manufacturing Co. has developed a high intensity reflector which is weather resistant and theftproof. Designated as Grote No. 12 Highway Delineator, this new reflector features a sealed, waterproof lens designed by Grote optical engineers. It meets specifications of all states and highway departments. The delineator mounts with a single bolt, and the lens then snaps into place providing a permanent lock against theft. Available in clear, red, amber or standard reflector colors.

CIRCULAR SLIDE RULE — Item 34

General Industrial Co. has started production on a handy circular slide rule for engineers and other plant and office executives. Operation of the rule is simple and the results accurate. To multiply, divide and find proportions is easy and exceptionally fast. Instructions are included with each rule.

TAPE KITS — Item 35

Convenient kits of plastic strips and dots have been developed by Corning Electronic Components for laying down circuit patterns on copper-clad Fotoceram printed circuit grid boards. Since the strips and dots withstand acid, when the grid boards are dipped in copper-etching solution the only copper that remains consists of the desired circuit layout.

WATER HEATERS — Item 36

Niagara Weldments, Inc., has introduced a line of fully standardized storage water heaters under the trade name "NiaWel." The all new line includes 55 sizes in both vertical and horizontal models plus a choice of 114 heating elements, all conforming to ASME specifications. To extend tank life and combat corrosion, NiaWel tanks can also be fabricated from copper-silicon, Monel, Inconel, aluminum, nickel-clad or stainless-clad steel. In additions, standard steel tanks can be supplied with various linings and coatings such as phenolic, porcelain, cement, or hot dip galvanizing.

TRANSMISSION — Item 37

Roberts Electric Co. has developed a new hydraulic transmission which permits low cost automation and modernization of existing machinery. With variable speeds ranging from 0 to 1600 RPM it may be applied to many kinds of machinery, such as pumps, winches, conveyors, construction machinery, elevators, etc. It features ball and roller bearings throughout, and weighs 100 lbs., measuring 22" long, 13" wide and 16" high. It may be driven at 1800 RPM or less with any two to ten HP motor or 20 HP gas engine. Controls are easily altered for remote control.

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